The COEVOLUTION Quarterly

From the end cap of "Model III"

O'Neill's Space Colonies

Practical

Desirable

Profitable

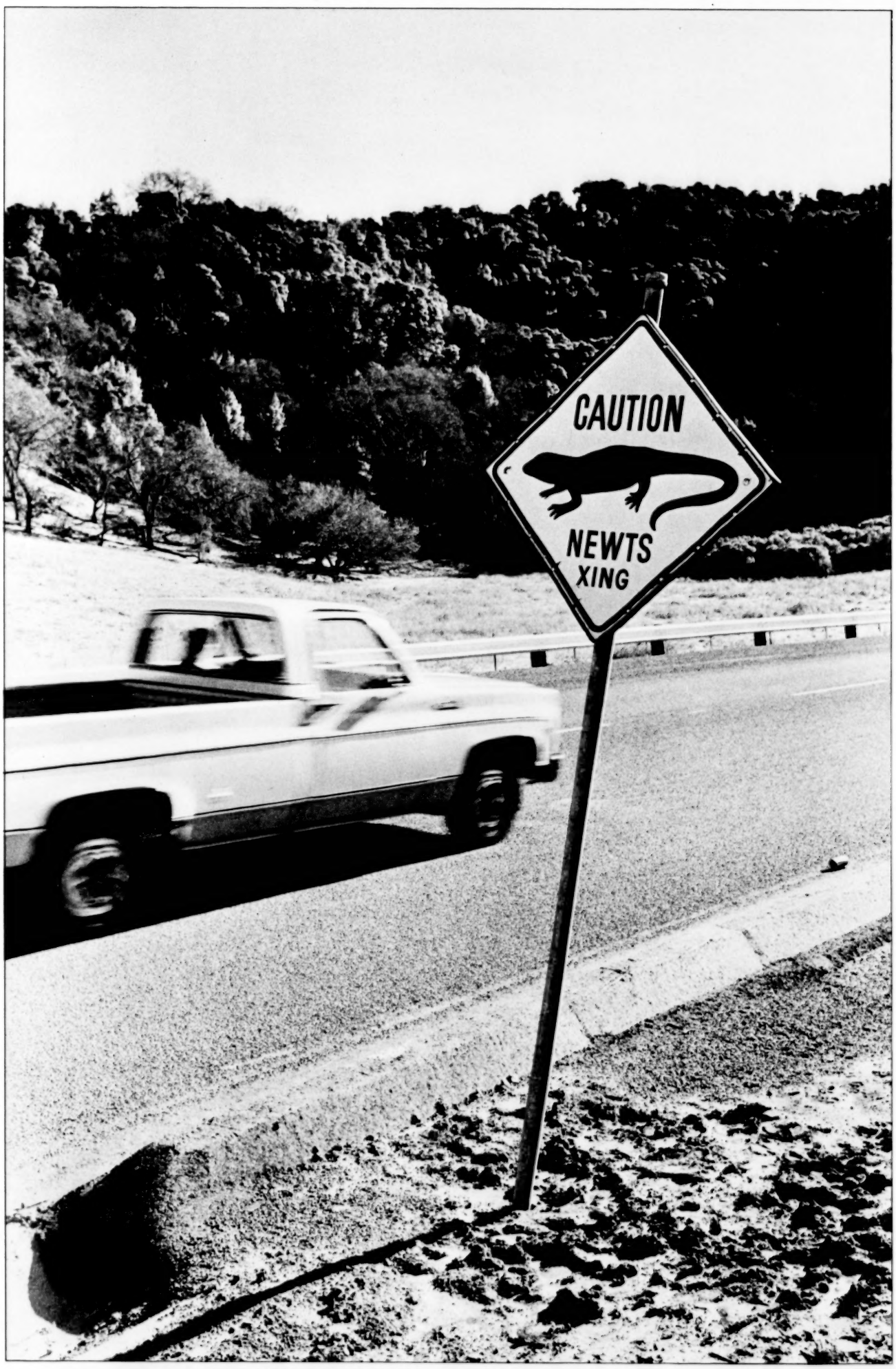
Ready in 15 years

See p. 4 and back cover

In this issue:

E. F. Schumacher
Jerry Brown, Governor of California
& Gregory Bateson
Orville Schell in China
David Shetzline fiction
Michael Phillips
Dan O'Neill
Brig. Gen. Sampson

$2.50 Fall 1975



Road in northern California

Larry Keenan, Jr.

Cover

The front cover shows the inside and the back cover the outside of Model III O'Neill Space Colonies, which have no decent reason not to be ready by 2000 AD. Details, pp. 4 - 23.

The front cover artist is Don Davis, 22, who has six years of painting and a high school degree behind him. He does illustrations for NASA, US Geological Survey, science fiction magazines, and, shortly, backgrounds for the new "Star Trek" movie being produced by Gene Roddenberry, starring all the original principals of the TV series.

The back cover illustration, freely given to us by NASA, is the work of two young men. Mike Przekop, a staffer at NASA Ames in California, worked out the basic design with an inter-active graphic computer. Rick Guidice of Los Gatos then did the painting.

The remarks in the cartoon above were first made by Ken Babbs (There comes a time . . .), Hazel Henderson (You can't manage . . . see p. 61), and the Atlanta group mind of Diana Fairbanks, Stephanie Mills, and Felicia Guest. I keep misquoting their motto to, "Is it now yet?"

—SB

Apocalypse Juggernaut, goodbye?

Free Space **4**

The High Frontier *by Gerard O'Neill* **6**

Testimony *by Gerard O'Neill* **10**
"Is the surface of a planet really the right place for an expanding technological civilization? *interviewing Gerard O'Neill* **20**
Life in Space **28**
Deep Space Material Sources *by Eric Drexler* **29**

Understanding Whole Systems

An Ecological and Evolutionary Ethic **30**
Where are the Earth's erogenous zones? •
Growth and Its Implications for the Future •
Of Schweickart, Hardin, Gaia and Brother David **31**

Caring and Clarity *conversation with Gregory Bateson and Edmund G. Brown, Jr., Governor of California* **32**

In the Beginning God Created the Banana *by Dan O'Neill* **48**
Gaia's cybernetics badly expressed. **51**

The Difference Between Unity and Uniformity *by E. F. Schumacher* **52**

Schumacher's Buddhism *by Peter Gillingham* **60**
Systems, Economics, & "Female" *by Hazel Henderson* **61**
Ocean Maps **63** Response to Sagan's Conjecture **64**
Viking & Sagan's nightmare **65**

Land Use

Plant a Tree **66**
The Garden *by Jay Kinney* **67**
The Complete Indoor Gardener & Grow It Indoors **71**
Pasture and Range Plants • Gourmet weeds: northwest region **72**
Wilson Seed Farms • Psycho-active hops — a research **73**
Acres, U.S.A. Conference *by Richard Nilsen* **74**
The Green Thumbook • The Magic of Findhorn **76**

Shelter

Freedom to Build • Septic Tank Practices **77**
Use It Again, Sam • How to Hide Almost Anything • Insulation **78**
National Construction Estimator • Concrete and Energy • "Waterless" shower • SmokeGard • Climate and House Design **79** Scandinavian Wood Stoves **80**
Advanced Wood-Burning *by Doug Dylla* **82**

Soft Technology

2

Understanding energy **86**
Connections • From Know-How to Nowhere • Low-energy economics **87**
BRAD Solar Roof • Kalwall notes • Sky Therm • Sundu Solar Heater **88**
Compendium • The Pegasus Unit • Another energy book •

The CoEVOLUTION Quarterly Fall 1975

NTIS on Solar Energy **89** Gemini Synchronous Inverter • Windpower Digest • Wooden wind-generator blades • Watchman Regulator **90** Drafting Technology & Practice • Steam engines • Dictionary of Scientific and Technical Terms **91** Sunspots **92**

Craft

Patterns for Guernseys, Jerseys & Arans • Columbine Spinning Wheel • Fricke Carding Machine **93**

Community

Working in China *by Orville Schell* **94**

From Field Guide to Western Oregon *by David Shetzline* **102**
South of the Slot *by Dan O'Neill* **105**
Gay Access *by Richard Hall and Dan Allen* **106**
New diaphragm - no jelly • Sharing the Children **111** Ecotopia **112**
True Representation *by Michael Phillips* **112**

Nomadics

The Honda station wagon • Fixing Cars • Miles-per-gallon meters **113** Geological Highway Maps • Gas Mileage Guide • Snow Camping & Nordic Skiing Gear • Skate sailing **114** Nordic Ski Patrol • Nordic catalogs **115**

Communications

The Reactive Engine Paper *by Terry Winograd* **116**
System Incoherence *by Marc Le Brun* **117**
From the Command Center: The Mayaguez Incident
Brigadier General Donald Sampson on the phone **119**
Structural Stability and Morphogenesis **129**

The Gathering Challenge to Fiat Money
by Carter Henderson **130**

Written Letters • More on "constants" **135**

Learning

Show Me! • The Gunter Papers **136**
The Way of a Pilgrim • The Tawasin **137**
Olson • Martial Arts Supplies **138**

Business

CATALOG & EPILOG Changes **139** Financial advice to CQ **141**
Dharma reader • Space Colonies questionnaire • Gossip **142**
CQ balance sheet • CREDITS **143** Back issues • New CATALOG **144**

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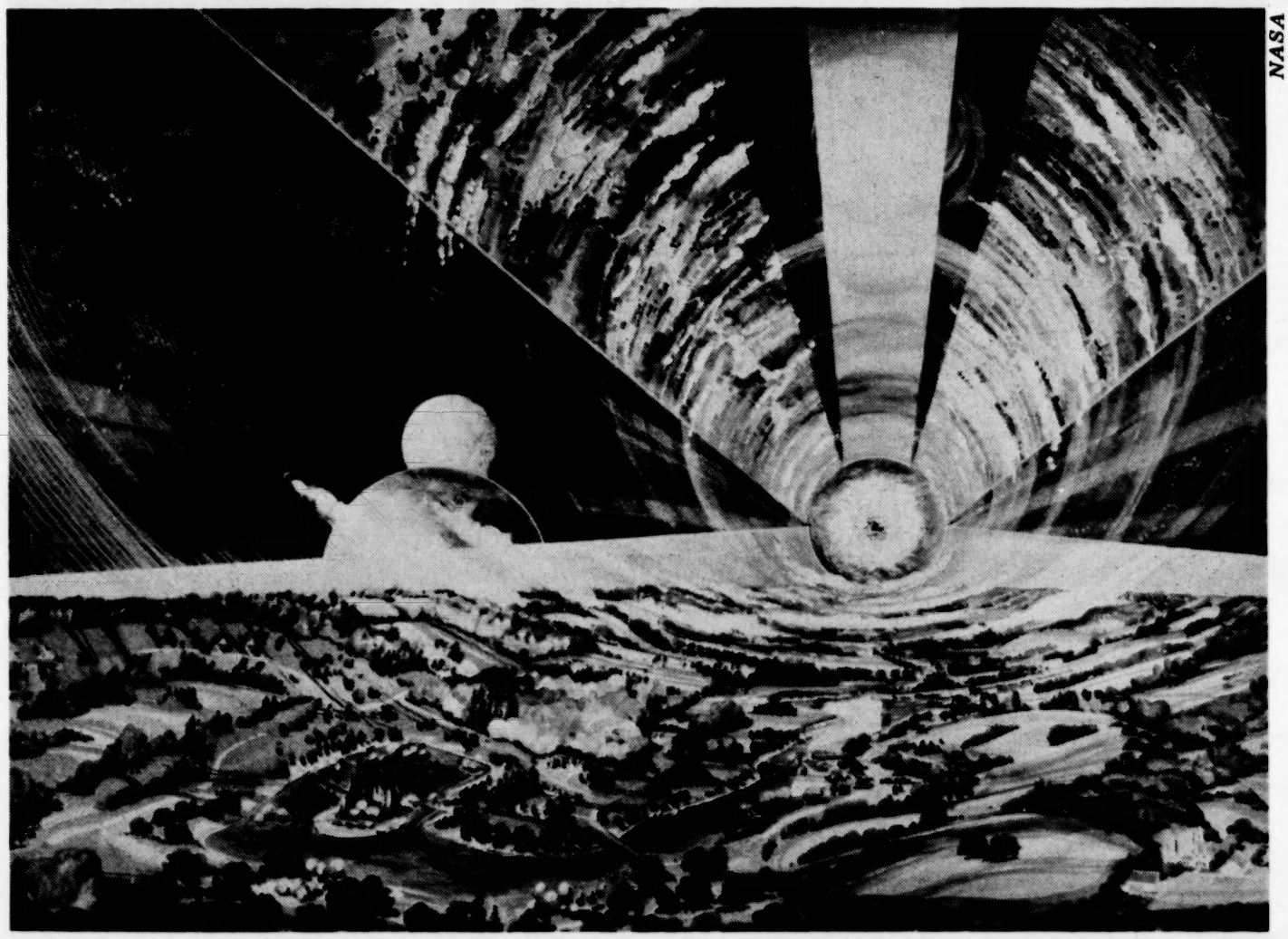
Apocalypse Juggernaut, goodbye?



NASA

Free Space

That's the technical term for everyplace outside the Earth's atmosphere. It's a political term. From now on it's a political reality.

Twenty-five pages of this issue are devoted to design details of Space Colony development as worked out by physicist Gerard O'Neill and colleagues. So far no one has successfully challenged the scale, the engineering, the budget, or the schedule of the scheme.

You are invited to find the fatal flaw, or to participate in the design and speculation.

One speculation I would make is to anticipate something like what happened in Europe when America was being colonized. Intellectual ferment. New lands meant new possibilities; new possibilities meant new ideas. If you can try things, you think up things to try.

Give your imagination a Space Colony of 1,000,000 inhabitants, each of whom has five acres of land. Know that it's readily possible – maybe inevitable – by 2000 AD. Any thoughts about how to organize its economy, politics, weather, land use, education, culture?

O'Neill notes that the ends of the enormous rotating cylinders could be mountain ranges, with the interesting property that as you climb higher your weight decreases. Near the top, at .1 g (1/10 of Earth gravity) you can don wings and take flight. Or you may want to take a long slow plunge into a swimming pool. Or watch someone

else's slow-motion splash. At the foot of the mountains you might have a round river, allowing you to canoe downstream several miles past the other two "valleys" and back to your home.

O'Neill expects that the colonies, once they begin to proliferate, would make themselves as appealing as possible to attract immigrants from Earth. Since the cylinders are big enough to have blue skies and weather, you might design a cylinder pair to have a Hawaiian climate in one and New England in the other, with the usual traffic of surf boards and skis between them (travel in Space is CHEAP – no gravity, no friction).

In all this there are some important distinctions from the experience of colonizing North America. One is the absence of natives – no conquering, no exploitation, no guilt this time. Warfare in general may be obsolete in Space. There is too vastly much free energy, materials, parking Space, and access – thousands of times what is on Earth – to be worth fighting over any part of it.

Free Space becomes what the oceans have ceased to be – the outlaw area, too big and dilute for national control.

Curious premonitions of all this are already under way. Grade-school children, I'm told by teachers, have been assuming for years that they would be living in Space. Russia and America have had Space programs all their lives.

In Russian-U.S. relations something funny is going on. One of the reasons (insiders tell me) that Kennedy gave the big push to Apollo – "We will land a man on the moon in this decade" – was economic. Missile development had peaked and we needed to keep those engineers employed. Last month America and Russia staged a joint space effort with the Apollo-Soyuz that seemed scientifically and even politically pointless. It is until you notice that the U.S. Space Shuttle program has lots of vehicles and little payload planned, and the Russian program has an ambitious Space station and no vehicles in the works. Both are counting on cooperation that the respective governments haven't acknowledged or possibly even expected yet.

When the cooperation becomes operational, what happens to the Arms Race? Every economic and political reason for it moves over to Space Colonies. There's a common ecological sequence from intimate competition to obligate mutualism.

The next steps now are mostly political. As Space Colonies becomes a generic subject – something that everyone knows about and has an opinion on, like Civil Rights, Women's Lib, Inflation – then it becomes part of political campaigns. Once a President or a Congress get into office with Space Colonies in their platform, or get the fever while they're in office, only then does the 15-year construction begin.

I think the voters will be interested enough to approve the requisite $100 billion (one-tenth the cost of Project Independence; 10 times the return

in energy alone). Space Colonies show promise of being able to solve, in order, the Energy Crisis, the Food Crisis, the Arms Race, and the Population Problem. Space Colonies are exciting – more interesting than war these days. And whether you like them or hate them, there's reason to support them.

I spoke at length about the Space Colonies to a gathering of 70 soft-tech freaks at Goddard College this summer. The subject polarized them hard. About two-thirds were disbelieving and resentful – not happy that I had taken away the Apocalypse they were organizing their self-discipline around. But they liked the idea that high technology and technologists and accompanying hazards might be sent off the Earth, out of our atmosphere. "Good riddance."

The other third was electrified at the possibilities, personal possibilities. "If we can get involved in the design now, maybe humankind could walk gently in the Universe."

Both critics and enthusiasts noted that Space Colonies could make terrible mistakes and not threaten Earth – they are separate systems – and that Earth could somehow blow it and perish but life would continue in Space.

My own conviction is that both the idea and reality of Space Colonies serve the realization of cultural/biological balance on Earth – exactly as the photographs of Earth from Space served the Ecology Movement. Space is part of the wildness in which lies "the preservation of the world."

Think for a while about cows and fences and grazing. The grass IS greener on the other side of the fence.

–SB
27 Aug 75

The High Frontier

BY GERARD O'NEILL

During the past decade a number of premises about the basic problems of the world have become very widely accepted. The more important of these accepted ideas are:

1) That for the forseeable future every significant human activity must be confined to the surface of the earth.

2) That the material and energy resources of the human race are just those of our planet.

3) That any realistic solutions to our problems of food, population, energy and materials must be based on a kind of zero-sum game, in which no resources can be obtained by one nation or group without being taken from another.

Given those premises, logic has driven most observers to the conclusion that long-term peace and stability can only be reached by some kind of systematic global arrangement, with tight constraints to insure the sharing, equable or otherwise, of the limited resources available. I find it personally shocking that many such observers, even those who profess to a deep concern for humankind, accept with equanimity the need for massive starvation, war or disease as necessary precursors to the achievement of such a systematic global arrangement.

Dr. Gerard O'Neill, 48, is a high-energy physicist best known for originating the colliding-beam storage ring, which has been adopted throughout the world. Since 1974 he has become better known to the general public as the designer and promoter of very large scale Space Colonies.

He is a professor at Princeton, a former Navy non-com, and a holder of the International Diamond Badge for soaring (about 1% of glider pilots have one).

This talk was given at the World Future Society convocation in Washington D.C. this spring. It was perhaps the least well-attended of the 100 or so panels and presentations. Futurists are more interested in problems than solutions this year. This talk is what converted me from mild interest in the Space Colonies to obsession.

—SB

In what follows, I will deliberately depart from my usual style. I will not hedge all my statements with cautious limits and buttress them with footnotes, as I would before a scientific audience or as I certainly shall when I testify before a Congressional subcommittee a few weeks from now. Rather, I will be assertive in style, so as to make clear by its shock-value how fundamentally different one new concept is.

If the studies which we have carried out at Princeton University continue to survive technical review, then I must tell you that in my opinion the three basic premises on which most discussions of the future have been based are simply wrong. The human race stands now on the threshold of a new frontier, whose richness surpasses a thousand fold that of the new western world of five hundred years ago.

That frontier can be exploited for all of humanity, and its ultimate extent is a land area many thousands of times that of the entire Earth. As little as ten years ago we lacked the technical capability to exploit that frontier. Now we have that capability, and if we have the willpower to use it we can not only benefit all humankind, but also spare our threatened planet and permit its recovery from the ravages of the industrial revolution.

These statements may sound like empty rhetoric. In the next few minutes I would like to sketch for you how they can be proven to be true. It is not necessary to have a technical background to appreciate these facts. Indeed, one of the most surprising aspects of the new opportunities is that they do not require new technology for their realization.

The high frontier which I will describe is space, but not in the sense of the Apollo program, a massive effort whose main lasting results were scientific. Nor is it space in the sense of the communications and observation satellites, useful as they are. Least

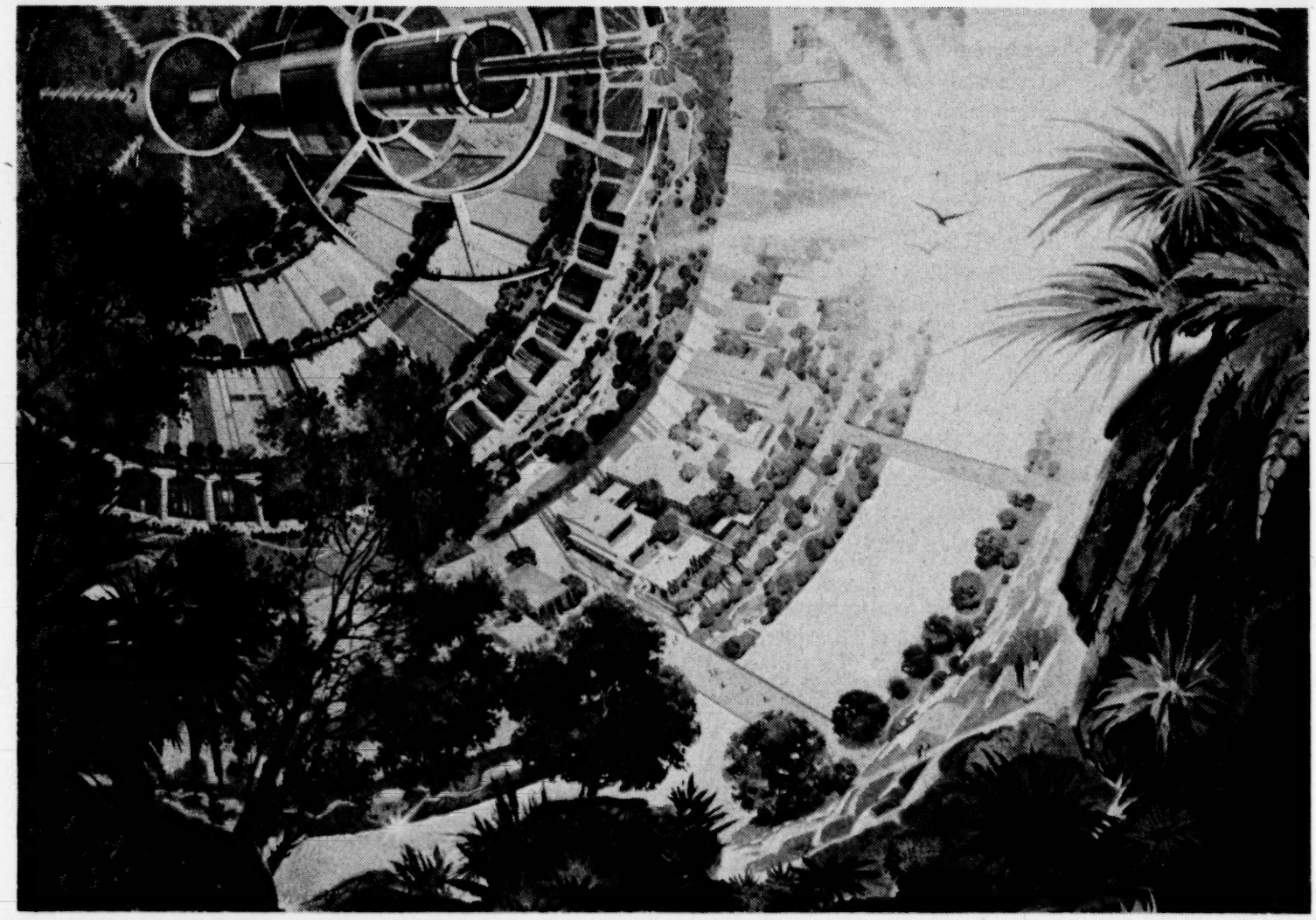


Figure 3. Possible interior design of a first, small-size space community. It could be large enough to provide comfortable apartments, shops, parks, small rivers and lush vegetation.

Copyright © 1975 Field Enterprises Educational Corporation. This illustration is one of several from "Settlers in Space" by Gerard O'Neill in Science Year — The World Book Science Annual — 1976. The book costs $8.95 from: Science Year, Box 3131, Merchandise Mart, Chicago, IL 60654. Our thanks to Arthur Tressler and Mrs. Clair Atwood.

of all is it space in the sense of science-fiction, in which harsh planetary surfaces were tamed by space-suited daredevils. Rather, it is a frontier of new lands, located only a few days travel time away from the Earth, and built from materials and energy available in space.

These are the facts which force a revolution in our thinking:

1) Solar energy: as everyone knows, the Sun is a virtually inexhaustible source of clean energy. It is difficult to use on Earth as more than a small supplement to other sources, though, for two reasons:

a) Unreliability: though solar energy is available full time in space, on Earth it is cut off by nighttime, by seasonal variation in the day-length, and by clouds.

b) Low average intensity: the cost of any solar power installation is the amortization cost of the equipment, because the source is free. The amount of solar energy which flows unused, in a year, through each square meter of free space is ten times as much as falls on an equal area in even the most cloud-free portions of Arizona or New Mexico. A given solar-energy installation in space, therefore, is potentially able to operate at a tenth the cost at which it could operate on Earth.

2) Materials: If we build new lands in space, starting from the Earth, we are the "gravitationally disadvantaged." We are at the bottom of a gravitational well 4000 miles deep, from which materials can only be lifted into space at great cost. Our technique must exploit the fact that the Moon has a gravitational well only 1/20 as deep, and as we now know from the Apollo samples is a rich source of metals, glass, oxygen, and soil. In the long run, we can use the fact that the asteroids are also a source of materials: the three largest asteroids alone contain enough materials for the construction of new lands with a total area many thousands of times as large as that of the Earth.

Briefly I will describe for you first the long-term then the immediate possibilities on this new frontier. As I do, remember that everything I describe is well within the limits of present-day, conventional materials, and of present technology. If we were to start now, with determination and drive, in my

opinion the first space community could be in place, with its productive capacity benefiting the Earth, before 1990. Other people who have made such estimates put the date about a decade later, but the surprising fact is that the agreement is that close. The reason is that the job requires straightforward engineering, not any basically new science – nothing as new and advanced as hydrogen fusion power, for example. To estimate conservatively what sort of habitat might be practical in the long term, perhaps 40 to 100 years from now, I'll sketch a space colony which is about as big as may be practical using present-day materials.

Recently the NASA/Ames laboratory completed a painting of the exterior of such a colony: note industry sites. A colony would be big enough to model some of the most desirable areas of the Earth. A portion of the island of Bermuda, or a section of the California coast like Carmel could be easily fit within one of the "valleys" of a Model III colony.

The date of realization of colonies of that size does not depend on materials or engineering – those we have already. Rather, it depends on a balance between productivity, a rising living standard and the economies possible with automation. Under the space-colony conditions of virtually unlimited energy and materials resources, a continually rising real income for all colonists is possible – a continuation rather than the arrest of the industrial revolution. Reasonable estimates of three per-cent per year for the real income rise, 8% for interest costs and 10% per year for automation advances put the crossover date (the date when large colonies become economically feasible) about 40 to 50 years from now – well within the lifetimes of most of the people who are now alive.

Colony construction is a bootstrap process, in which one starts small, the first small colony builds the next larger, and so on. The first space community might house about 10,000 people. My coworkers and I sometimes call it Model 1, or Island One. We think it could be built in 15 to 25 years, at a cost per year probably not much higher than that of Project Apollo, and not more than one or two tenths of the annual cost of Project Independence. To be realized, of course, its immediate economic return must be far higher, because of interest ammortization with discounted economics. Later I will describe that return.

Island One will need careful design, with spot shielding for cosmic-ray protection. It may run in an enriched oxygen atmosphere. At the L5 Earth-Moon Lagrange libration point, though small, Island One could be a far more attractive environment for living than most of the world's population now experiences.

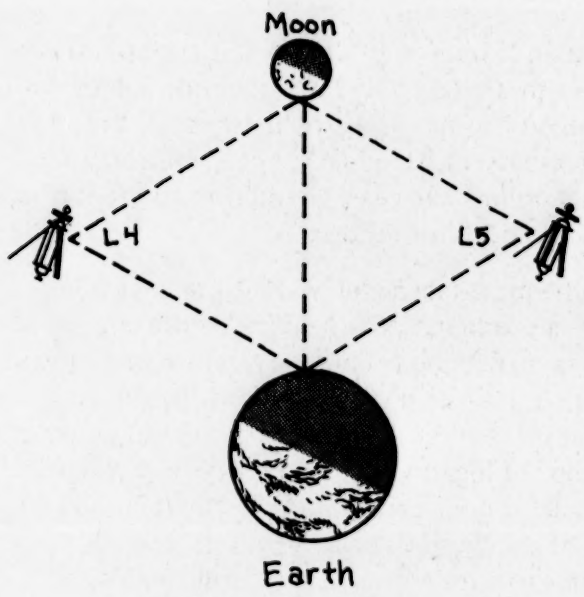


Figure 1. Location of the Lagrange points L4 and L5. Each is on the orbit of the Moon and is the third point of an equilateral triangle, the Earth and Moon being the other two points. Space communities could be located on stable orbits about either L4 or L5.

To obtain from an investment not much larger than that of Project Apollo a return many thousands of times as great, we need a trick: the trick is to exploit the low gravity and vacuum environment of the Moon, to obtain from the lunar surface 98% of the material needed for Island One. For the entire construction of Island One the excavation left on the moon will be only 7 X 200 X 200 yards.

The machine to transport the lunar material is called a mass driver; it exists only on paper, but it can be designed and built with complete assurance of success because it requires no high-strength materials, no high accelerations or temperatures, and its principles are fully understood. Running only 25% of the time, the mass driver could lift 500,000 tons of material to L5 in the 6 year construction time of Island One. An identical machine, located in space, could be a very effective reaction motor for the shifting of heavy payloads, in the 100,000 ton range.

Once Island One is completed, it can become a manufacturing facility with a unique advantage, for those products whose end-use is in high orbit above the Earth. The economic payoff from Island One can be estimated by noting that a typical industry on Earth yields about 20 tons of finished products per man-year of labor, with a dollar value averaging a dollar per pound.

The lift cost from Earth to L5 or to geosynchronous orbit now averages a thousand dollars per pound. The space shuttle and simplified derivatives of it can bring that cost down to 300-400 $/pound. Very advanced large rockets, taking many years

and tens of billions of dollars to develop, might reduce that cost to 50-100 $/pound. Taking for conservatism the lowest of those rates, the productivity of Island One would be worth 20 billion dollars per year, in addition to the intrinsic value of goods it produces.

That might be academic were it not that there exists a product, badly needed, whose end-use is in high orbit: the product is satellite solar power. For several years design groups at Boeing Aircraft and at the Arthur D. Little Co. have studied the concept of locating large solar power stations in geosynchronous orbit, where sunlight is available 99% of the time, to beam down microwave power to the earth for conversion to ordinary AC or DC power. Oddly enough, the microwave link problem appears solved in principle: 56% efficiency has been demonstrated, and the goal is only 63% to 70%: the stumbling block to realization has just been the lift costs.

By using Island One as a manufacturing facility, it appears that the barrier can be broken and economical solar power achieved. The key point is that the use of lunar materials eliminates the need for incurring the high-lift costs from the Earth, and so appears capable of giving solar electric power on Earth at rates initially competitive, and eventually much lower than coal-fired or nuclear power plants. This is of prime importance for world peace, because the energy source is inexhaustible, and these power stations can be built for any nation that needs them.

If exploited, this approach would also eliminate the need for developing breeder reactors, whose plutonium production would always be subject to theft and use by terrorists.

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If exploited, this approach would also eliminate the need for developing breeder reactors, whose plutonium production would always be subject to theft and use by terrorists.

It should also be emphasized that the provision of unlimited low-cost energy to the developing nations will probably be the most effective contribution we could make to solving the world's food problem, because the cost of chemicals for high-yield agriculture is almost entirely the cost of energy for their production.

Throughout this discussion you may have noticed that I have been careful to avoid prophecy. I am pointing out a realistic possibility: the drivers to make it happen are there: immediate jobs, of the high-technology kind which economic studies have shown generate wealth throughout an economy; the direct payback of a much-needed, marketable product. Evidently deeper human needs are also driving this development, because of all the correspondence I receive on this subject only 1% is in opposition to it, and only another 1% is in any way irrational or unintelligent. Yet I do not say it will happen, or when. I hope it will, and soon.

While carefully avoiding prophecy, in closing I would like to show the potential power of the space-colonization approach by showing what could happen if the high frontier were to be explored and exploited by all of humankind: if the construction of new lands in space were to take place on the fastest possible time-scale.

If that were to happen, by about 2018 emigration to better land, better living conditions, better job opportunities and greater freedom of choice and opportunity in small scale, eventually independent communities could even become a viable option for more people than the population increase rate. That time is less than forty-five years away.

If the new option is taken, it would be naive to assume that its benefits will be initially shared equably among all of humankind. The world has never worked that way, and since people do not change there is no reason to suppose that it will work that way in this case. But the resources of space are so great that even nations which achieve only after a long delay the ability to use them will still find an abundance remaining. There are in my opinion at least five or six nations or groups of nations which possess the technical and economic ability to carry out the construction of Island One, the first real beachhead in space, on their own. Some one of these nations or groups may get there first, or — in my opinion preferably — they may do so together. It seems to me that we have in this case the opportunity for a cooperative international program which could have a real stabilizing effect on world tensions; and, knowing that the resources of space are so great, we who may be among those first to exploit them can well afford to provide for our less advantaged fellow humans the initial boost that will permit their exploiting these new resources for themselves. Suddenly given a new world market of several hundred billion dollars per year, the first group of nations to build space manufacturing facilities could well afford to divert some fraction of the new profits to providing low-cost energy to nations poor in mineral resources, and to assisting underdeveloped nations by providing them with initial space colonies of their own.

If we use our intelligence and our concern for our fellow human beings in this way, we can, without any sacrifice on our own part, make the next decades a time not of despair but of fulfilled hope, of excitement, and of new opportunity. ■

Space Colonization and Energy Supply to the Earth

TESTIMONY

OF

DR. GERARD K. O'NEILL

BEFORE THE
SUB-COMMITTEE ON
SPACE SCIENCE AND APPLICATIONS
OF THE
COMMITTEE ON SCIENCE AND TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES
JULY 23, 1975

INTRODUCTION

Within the past year a new possibility for the direction and motivation of our thrust into space has reached the stage of public discussion. It is called space colonization, or the development of space manufacturing facilities. Our present American leadership in space technology gives us a unique opportunity to play a central role in that new development, if we act with decision and speed.

The central ideas of space colonization are:

1) To establish a highly-industrialized, self-maintaining human community in free space, at a location along the orbit of the moon called L5 (*Figure 1*), where free solar energy is available full time.

2) To construct that community on a short time scale, without depending on rocket engines any more advanced than those of the space shuttle.

3) To reduce the costs greatly by obtaining nearly all of the construction materials from the surface of the moon.

4) At the space community, to process lunar surface raw materials into metals, ceramics, glass and oxygen for the construction of both additional communities and of products such as satellite solar power stations. The power stations would be relocated in synchronous orbit about the earth, to supply the earth with electrical energy by low-density microwave beams.

5) Throughout the program, to rely only on those technologies which are available at the time, while recognizing and supporting the development of more advanced technologies if their benefits are clear.

THE SPACE COLONY CONCEPT

Although it has precursors in the works of many authors, the modern idea of space colonies originated from several questions, posed six years ago as an academic exercise:

1) Is it possible, within the limits of 1970's technology, using only the ordinary construction materials with which we are already familiar, to build communities in free space rather than on a planetary surface like the earth, the moon, or Mars?

2) Can these communities be large enough, and sufficiently earth-like, to be attractive to live in; small worlds of their own rather than simply space stations?

3) Would such colonies have unique advantages from an economic viewpoint, so that they could justify the costs of their construction and contribute in a productive way to the total human community?

4) If such colonies were built, would their further development be such as to relieve the earth of further exploitation by the industrial revolution, and to open up a new frontier to challenge the best and highest aspirations of the human race?

Surprisingly, six years of continued research has confirmed, in even more increasing detail, that the answer to all four of these questions is a strong "yes."

GEOMETRIES

The largest colonies now forseeable would probably be formed as cylinders, alternating areas of glass and interior land areas. From those land areas a resident would see a reflected image of the ordinary disc of the sun in the sky (*Figure 2 – front cover*), and the sun's image would move across the sky from dawn to dusk as it does on earth. Within civil engineering limits no greater than those under which our terrestrial bridges and buildings are built, the land area of one cylinder could be as large as 100 square miles. Even a colony of smaller dimensions could be quite attractive.

Rotation of the cylinder would produce earth-normal gravity inside (*Figure 3*), and the atmosphere enclosed could have the oxygen content of air at sea-level on earth. The residents would be able to choose and control their climate and seasons.

Agriculture for a space community would be carried out in external cylinders or rings (*Figure 4 – back cover*), with atmospheres, temperatures, humidity and day-length chosen to match exactly the needs of each type of crop being grown. Because sunshine in free space is available 24 hours per day for 12 months of the year, and because care would be taken not to introduce into the agricultural cylinders the insect pests which have evolved over millennia to attack our crops, agriculture in space could be efficient and predictable, free of the extremes of crop-failure and glut which the terrestrial environment forces on our farmers.

INDUSTRY

Non-polluting light industry would probably be carried on within the cylindrical living-habitat, convenient to homes and shops. Heavy industry, though, could benefit from the convenience of zero gravity. Through an avenue on the axis of the cylinder, workers in heavy industry could easily reach external, non-rotating factories (*Figure 4 – back cover*), where zero gravity and breathable atmospheres would permit the easy assembly, without cranes, lift-trucks or other handling equipment, of very large, massive products. These products could be the components of new colonies, radio and optical telescopes, large ships for the further human exploration of the solar system, and power plants to supply energy for the earth.

Punky Crow

Gerard O'Neill (left) and model of Space Colony before the sub-committee.

LIMITS OF GROWTH

In the early years of this research, before the question of implementation was seriously addressed, it seemed wise to check whether an expansion into space would soon encounter "growth limits" of the kind which humankind is now reaching on earth, and which have been vividly described for us by Professor Jay Forrester of Massachusetts Institute of Technology, in studies supported by the Club of Rome.

If the space colonization program is begun, its technical and economic imperatives seem likely to drive it rather quickly toward the exploitation of asteroidal rather than lunar materials. Long before the results of mining activity on the moon became visible from the earth, the colony program would be obtaining its materials from the asteroids. Given that source, the "limits of growth" are absurdly high: the total quantity of materials within only a few known large asteroids is quite enough to permit building space-colonies with a total land area more than ten thousand times that of the earth.

ENERGY WITHOUT GUILT

The efficiencies of a space community, regarded as an island of a technological human civilization, stem from the abundance and full-time dependability of free solar energy in that environment, and from the possibility of controlling the effective gravity, over a wide range from zero to more than earth-normal, by rotation. In contrast, industrial operations on earth are shackled by a strong gravity which can never be "turned off"; those on the moon would be similarly limited, although the limit would be lower.

In a space colony, the basic human activities of living and recreation, of agriculture, and of industry could all be separated and non-interfering, each with its optimal gravity, temperature, climate, sunlight and atmosphere, but could be located conveniently near to each other. Energy for agriculture would be used directly in the form of sunlight, interrupted at will by large, very low-mass aluminum shades located in zero gravity in space near the farming areas. The day-length and seasonal cycle would therefore be controllable independently for each crop.

Process heat for industry would be obtained with similar economy; in space, temperatures of up to several thousand degrees would be obtainable at low cost, simply by the use of low-mass aluminum-foil mirrors to concentrate the ever-present sunlight. In space, a passive aluminum mirror with a mass of less than a ton and a dimension of about 100 meters, could collect and concentrate, in the course of a year, an amount of solar energy which on earth would cost over a million dollars at standard electricity busbar rates.

Electrical energy for a space community could be obtained at low cost, within the limits of right-now technology, by a system consisting of a concentrating mirror, a boiler, a conventional turbogenerator and a radiator, discarding waste heat to the cold of outer space (*Figure 5*). It appears that in the environment of a space community residents could enjoy a per capita usage of energy many times larger even than what is now common in the United States, but could do so with none of the guilt which is now connected with the depletion of an exhaustible resource.

THE BOOTSTRAP METHOD

Until recently, it had been assumed that the only practical way to locate or assemble an object in a high orbit was to build it or its components on earth, and then to lift it out of the earth's gravity, through the atmosphere, by rockets. One might fairly call this the "brute force" method. In space colonization, we would like to use a far more economical alternative, a kind of "end run" instead of a power play through the middle. It is outlined in *Figure 6*.

Here on the surface of the earth we are at a very low point in the gravitational map of the solar system. In energy terms, we are at the bottom of a gravitational well which is 4,000 miles deep. This is reflected in the fact that we must accelerate a spacecraft to a speed of more than 25,000 miles per hour before it can escape the earth's gravity and go as far as lunar orbit. In a sense, we are the "gravitationally disadvantaged."

We are fortunate that we have another source of materials, which lies at a much shallower point in the gravitational map of the solar system. The energy required to bring materials from the moon to free space is only 1/20 as much as from the earth. Further, the moon has no atmosphere: a disadvantage if we wanted to live there, but a great advantage if we want to obtain from the moon materials at low cost. On the moon we could assemble a launching device for the acceleration to escape velocity of lunar surface raw materials. Such a machine does not require high-strength or high-temperature materials, and the methods for building it are well understood. One design of that kind is called a mass-driver (*Figure 7*): it would be a linear electric motor, forming a thin line several miles long, which would accelerate small 10-pound vehicles we call buckets. At lunar escape speed the bucket would release its payload, and would then return on a side track for reuse. Only the payload would leave the mass-driver, so nothing expensive would be thrown away. The mass-driver would be an efficient machine, driven by a solar-powered or nuclear electric plant, and our calculations show that in six years of time it could launch to escape distance from 300 to 1000 times its own mass. A collector at escape distance from the moon would accumulate materials, and there, with the full solar energy of free space, they would be processed to form the metals, glass and soil of the first space community.

With the help of that economy measure, the mass lifted from the earth need only be a few percent of the mass of the colony itself. We would have to bring the components of the mass-driver and of a lunar outpost (*Figure 8*), components of a construction station in lunar orbit for the processing and assembly of materials, and those elements, mainly carbon, nitrogen and hydrogen, which are rare on the moon. By so avoiding the need for prior development of advanced high-capacity lift vehicles, we could also carry out the construction of the first colony on a fast time

scale, possibly beginning as early as 1980-82 when the space shuttle will come into operation. For the lifting of freight to low orbit, we would need one new vehicle, of a type which the aerospace experts call a "dumb booster": a freight rocket based on the same type of engines already developed for the shuttle. For operations in space above low orbit a chemical tug would be sufficient. My recommendation would therefore be strongly supportive of a recently-initiated NASA study of the design of a shuttle-derived heavy-lift vehicle, and of a chemical tug whose segments could be lifted to orbit by the shuttle.

In this approach, we would establish a productive beachhead in space as early as possible, and as the resulting traffic increased would let its revenue assist in paying for the further development of more advanced launch vehicles.

LUNAR MATERIALS

At the time of the Apollo project we did not think of the moon as a resource base. The moon landings, originally motivated by national pride and a sense of adventure, became scientific expeditions and as such returned a high payoff in knowledge.

Now, though, it is time to cash in on Apollo. It was impossible to plan in a rational way a program of space colonization until the Apollo lunar samples were returned for analysis. From those samples we now have the analyses of the lunar soil and rock. *Table 1* summarizes representative data from soils at the Apollo II landing site:

TABLE 1

UNSELECTED APOLLO II SOIL SAMPLE

Oxygen	40%	Titanium	5.9%
Silicon	19.2%	Aluminum	5.6%
Iron	14.3%	Magnesium	4.5%
Calcium	8.0%		

This unselected sample is more than 30% metals by weight.

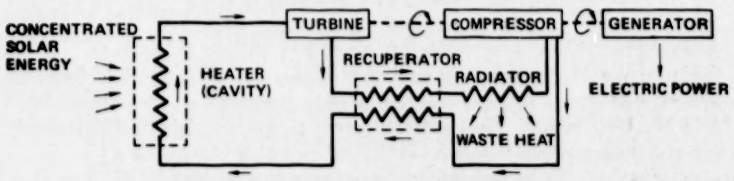
The baseline mass-driver would be capable of transferring from the moon from 1/2 million to 2 million tons of such materials within a six-year period: that is, from 28,000 to over 100,000 tons of aluminum, 70,000 to 280,000 tons of iron, and corresponding amounts of the other lunar materials. Strangely, though the lunar surface is devoid of life, its most abundant element is the one which we need in every breath we take: oxygen. That oxygen, transported to free space and unlocked from its binding metals by solar energy, would be usable not only for an atmosphere but to fuel rocket engines, reducing by 85% the requirement for fuel carried from the earth.

The lunar surface materials are poor in carbon, nitrogen and hydrogen; in the early years of space colonization these elements would have to be brought from earth. They would be reused, not thrown away. For every ton of hydrogen brought from earth, nine tons of water could be made at the colony site, the remaining eight tons being oxygen from the processing of lunar oxides.

The removal of half a million tons of material from the surface of the moon sounds like a large-scale mining operation, but it is not. The excavation left on the moon would be only 5 meters deep, and 200 meters long and wide: not even enough to keep one small bulldozer occupied for a five-year period.

A few years after the first space community is built we can expect that transport of asteroidal materials to L5 will become practical. No great technical advance is required for that transition; the energy-interval between the asteroids and L5 is only about as great as between the earth and L5. Once the asteroidal resources are tapped, we should have not only metals, glass and ceramics, but also carbon, nitrogen and hydrogen. These three elements, scarce on the moon, are believed to be abundant in the type of asteroid known as carbonaceous chondritic. Therefore I add my support to those who for several years have been recommending an unmanned rendezvous-probe mission to a selected asteroid. Such a mission has already been studied in detail by NASA, and is well within present technical feasibility. If conducted in the late 1970's or early 1980's, with the aim of assaying a carbonaceous chondritic asteroid for its C, N, H content, such a mission would serve the same function that oil well prospecting now serves on earth: the finding and proving of necessary resources for subsequent practical use.

Brayton Cycle Schematic



5. Schematic of a closed-cycle turbogenerator using helium as a working gas. A large fossil-fuel power plant using this kind of turbine is now being installed for commercial power generation at Oberhausen, in West Germany.

ISLAND ONE

The first space community will be economically productive only if talented, hard-working people choose to live in it, either permanently or for periods of several years. It must therefore be much more than a space-station; it must be as earth-like as possible, rich in green growing plants, animals, birds, and the other desirable features of attractive regions on earth.

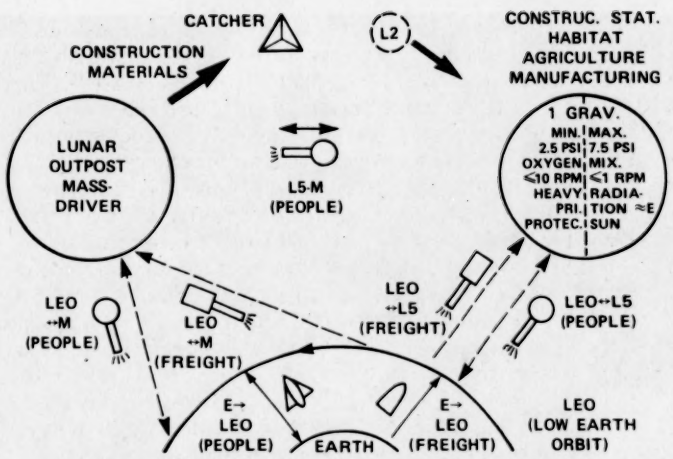
Within the materials limits of ordinary civil engineering practice, and within an overall mass budget of 1/2 million tons (about the same as the mass of a super-tanker), several designs for this first "Island in Space" have evolved. One such geometry is shown in *Figure 3*; I am indebted to Field Enterprises, Inc. for permission to show this figure, which is from the 1976 edition of Science Year.

All of the geometries we have studied are pressure vessels, spherical, cylindrical or toroidal, containing atmospheres and rotating slowly to provide a gravity as strong as that of the earth. With gravity, good long-term health can be maintained; the colonists should experience none of the bone-calcium loss suffered by the Skylab astronauts in their zero-gravity, non-rotating environment.

Physiology experiments in rotating rooms on earth indicate that humans can acclimatize to quite high rotation rates, some to as much as one rotation every six seconds. A fraction of the space-community population will, though, "commute" daily between the rotating earth-gravity environment and zero or low-gravity work areas. We must therefore hold the rotation rate to a rather low value, to avoid inner-ear disturbances. It is quite possible that our lack of information is forcing us toward unnecessary conservatism on this point. It would be quite useful to carry out long-term physiology experiments during the space-shuttle program, to examine rotation effects in the space environment. On earth our simulation of these effects can never be more than approximate.

Conservatism on this requirement has, though, led us quite recently to a new and possibly more attractive alternative design (*Figures 10, 11*). It allows for natural sunshine, a hillside terraced environment, considerable bodies of water for swimming and boating, and an overall population density characteristic of some quite attractive modern communities in the U.S. and in southern France.

It is startling to realize that even the first-model space-community could have a population of 10,000 people, and that its circumference could be more than one mile. From the valley area, where as in *Figure 3* streams could flow, a ten-minute walk could bring a resident up the hill to a region of much-reduced gravity, where human-powered flight would be easy, sports and ballet could take on a new dimension, and weight would almost disappear. It seems almost a certainty that at such a level a person with a serious heart condition could live far longer than on earth, and that low gravity could greatly ease many of the health problems of advancing age. In *Figures 10* and *11*, the outer ring is a toroidal volume used for agriculture. It too would rotate to provide earth-gravity, but more slowly; its rotation would compensate for the gyroscopic action of the main living habitat, and permit the axis of the habitat always to point toward the sun.



6. Schematic of transportation flow for space colonization. With the space-shuttle and simpler vehicles easily derived from it at low development cost, a lunar mining outpost and an L5 construction-station would be set up. A large fraction (over 95%) of all materials for colony-construction and later manufacturing would then be obtained from the lunar surface by an automated, high-efficiency launch system.

Just beyond the hemispherical ends, a few minutes from the residential areas, there could be large assembly areas, with low or zero gravity. In one design now being studied these areas would be cylindrical, rotating once every 70 seconds, and would provide 1-1/2% of earth-gravity. There, a ton of mass would weigh only 30 pounds, but tools and equipment would stay put when set "down." Workers commuting to those areas would experience rotation-rate changes of no more than one rpm.

COST DRIVERS IN SPACE-COLONY CONSTRUCTION

During the past six months, independent cost estimates for the construction of Island One have been made by the NASA Marshall Space Flight Center. These are not at the stage of an official report, but excellent cooperation and communication between Princeton and NASA/MSFC has allowed identification of some important cost-drivers in the construction of a first colony. These are:

1) Frequency and efficiency of crew-rotation between the earth and L5, and between the earth and the moon, during the construction period.

2) Extent of resupply needed during construction: This item can vary over a wide range, depending on the atmospheric composition needed at the construction station, and whether food is brought in water-loaded or dry form.

3) Atmospheric composition: The structural mass of Island One is proportional to the internal atmospheric pressure, but independent of the strength of the artificial gravity produced by rotation. Nitrogen constitutes 79% of our atmosphere on earth, but we do not use it in breathing: to provide an earth-normal amount of nitrogen would cost us two ways in space-colony construction, because structure masses would have to be increased to contain the increased pressure, and because nitrogen would have to be imported from the earth. A final choice of atmospheric mix would be based on a more complete understanding of fire-protection.

Parenthetically, the tragic Apollo fire of 1967 is not a valid guide in making this choice. It occurred in a confined capsule, with no water supply available, and in an atmosphere of nearly pure oxygen at almost 15 pounds per square inch of pressure – nearly five times earth-normal. A space colony would operate at 1/5 to 1/6 of that oxygen pressure, in a very large environment, with abundant water available everywhere.

A modest program of experiments on earth could add greatly to knowledge on this point, and might save a great deal of money. Lacking such experiments, present designs are conservative, based on carrying a substantial pressure of nitrogen.

COSTS AND PAYOFFS

A range of costs for large-scale engineering projects is listed in *Table 2*, for scale:

TABLE 2

APPROXIMATE COSTS OF ENGINEERING PROJECTS, IN 1975 DOLLARS

a) Panama Canal	2 Billion Dollars
b) Space Shuttle Development	5-8 Billion Dollars
c) Alaska Pipeline	6 Billion Dollars
d) Advanced Lift Vehicle Development	8-25 Billion Dollars
e) Apollo	39 Billion Dollars
f) Super Shuttle Development	45 Billion Dollars
g) Manned Mission to Mars	100 Billion Dollars
h) Project Independence	600-2000 Billion Dollars

(The re- or devaluation of the dollar forward or backward to 1975 makes each of the numbers in Table 2 uncertain by at least 25%.)

The Apollo project provided trips to the moon for a total of twelve men, at a cost of about 3 billion dollars per man. In space colonization we are considering, for Island One, a thousand times as many people for a long duration rather than for only a few days. With the cost savings outlined earlier, it appears that we can accomplish this thousand-fold increase at a cost of at most a few times that of the Apollo project.

It does not appear worthwhile to make a new, detailed cost estimate at this time for the establishment of Island One. Design details are changing as additional people join the studies, new optimizations and new solutions to technical problems are being found, and the actual cost of construction will clearly depend not only on that work in progress, but on the details of project management.

Rather, I will summarize in *Table 3* estimates made up to this time, characterizing the approach used for each estimate.

TABLE 3

PRELIMINARY ESTIMATES OF COST FOR L5 PROJECT (ESTABLISHMENT OF ISLAND ONE) IN 1975 DOLLARS

a) Physics Today, September 1974 (G.K. O'Neill) **33 Billion Dollars (0.85A)**	Spartan. No crew rotation; oxygen atmosphere; little resupply. Power plants on moon and L5 at 10 Kg/Kw.
b) Internal unpublished report, NASA/MSFC, Jan. 1975 (E. Austin, et al.) as modified April 1975. **200 Billion Dollars (5.1A)**	Luxurious. Includes chemical and nuclear tugs, super shuttle development, orbital bases, oxygen/nitrogen mix, extensive crew rotation, resupply at 10 lbs./man-day, power plants at 100 Kg/Kw.
c) NASA/MSFC re-estimate April 1975 (E. Austin) as reported to meeting at NASA Headquarters (J. Yardley, J. Disher, R. Freitag and others) **140 Billion Dollars (3.6A)**	High. Unnecessary lift systems removed, but still includes oxygen/nitrogen mix, crew rotation, resupply at 10 lbs./man-day, power plants at 100 Kg/Kw.

(Note: The unit "A" is the cost of Project Apollo in 1975 dollars.)

Detailed conversations with NASA personnel involved in cost estimation indicates a desire on their part, natural enough, to include in the estimates a contingency factor for problem areas not yet identified. The higher estimates listed above appear to include such contingency factors. Within the uncertainties characteristic of the early phase of any project, a figure of 100 billion dollars with limits of 50 billion dollars either way may be as close an estimate as can be made at this time; that is, 5% to 15% of Project Independence, or 2.5 times the cost of Project Apollo.

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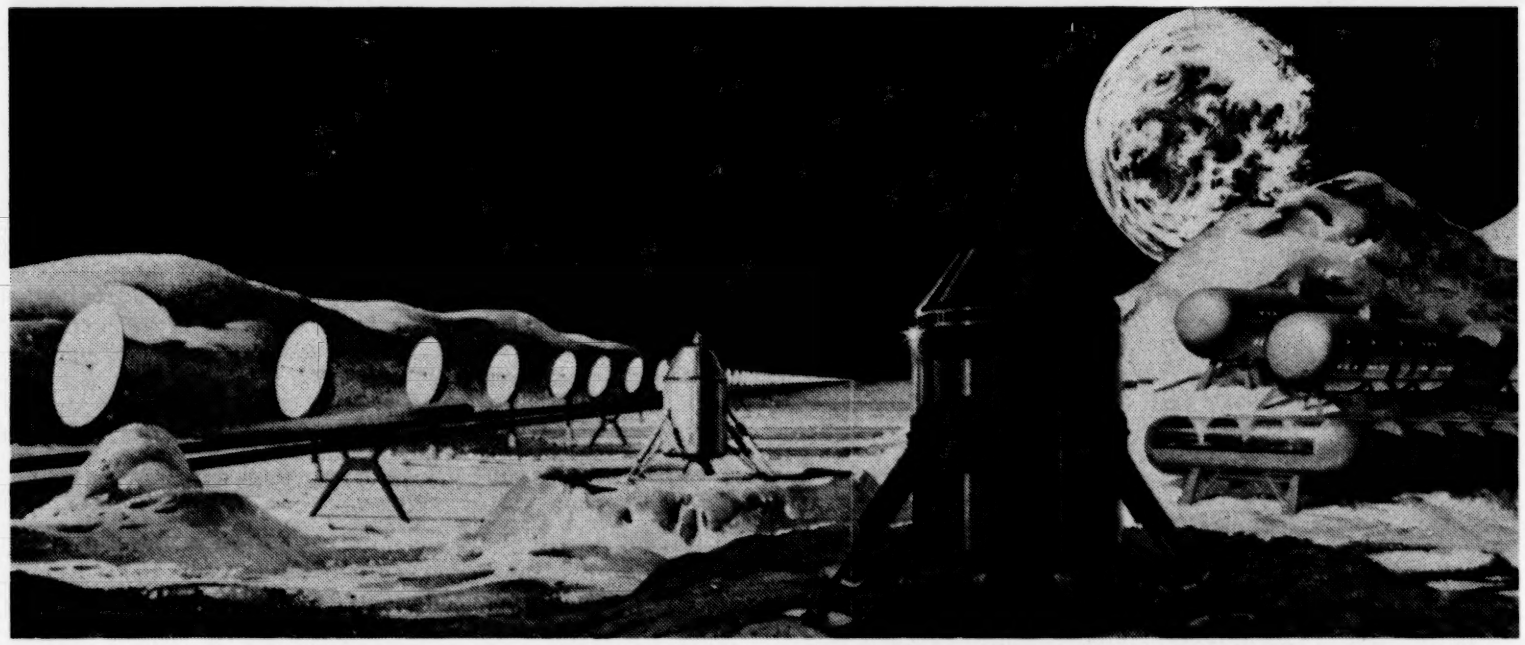


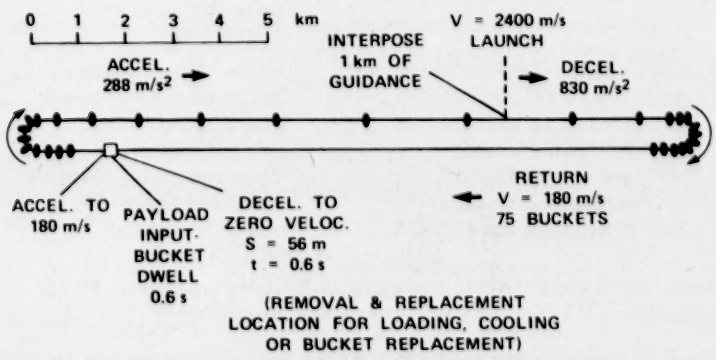
8. Artist's view of a lunar mining outpost and mass-driver, powered by solar energy. All the materials for construction of the first 10,000 person space community could be obtained from an excavation 5 meters long and wide.
Copyright © 1975 Field Enterprise Educational Corporation.

The payoffs from the existence of Island One can be estimated in several ways. One, crude but reasonable, is to assign to the material output of Island One's industries an added value, per pound of finished products, equal to the lift cost of bringing similar products from the earth. For shuttle-derived heavy lift vehicles, and productivities typical of heavy industry on earth, that added value is in the range of 40-160 billion dollars/year; equal, that is, in one year to the whole cost of construction of the first colony. That added value exists only for those finished products whose end use is in high orbit (geosynchronous, L5 or beyond). One such product, of prime importance at this time, is satellite solar power stations.

ENERGY FOR THE EARTH

Both the oil-consuming nations and the underdeveloped third world are vulnerable to the threat of supply cutoff from the Middle East. The only permanent escape from that threat lies in developing an inexhaustible energy source with a cost so low that the source can eventually be used to produce synthetic fuels economically.

The intensive development of nuclear energy does not seem to be an adequate solution: nuclear power is moderately expensive (15 mils/KWH) and its use encounters considerable public resistance. Nuclear proliferation and radioactive waste disposal are real problems.



7. Schematic of an electromagnetic mass-driver. Small "Buckets" supported magnetically would each be accelerated to lunar escape velocity. Over a one-kilometer drift space the direction and speed of the bucket would be sensed and adjusted by additional magnetic coils. The bucket would then release its payload, and return to pick up another. The payload would climb out of the moon's gravity, arriving at a low speed for collection and processing.

Fossil fuels are scarcer now, and intensive strip-mining for coal will almost inevitably further damage the environment. Solar energy on the earth is an unreliable source, suitable for daytime peak loads in the American southwest, but not clearly competitive in most applications.

Solar energy converted to electricity in space, beamed to earth by microwaves, and reconverted here to ordinary electricity, is being studied with increasing seriousness (*Figures 12, 13*). Already an overall transmission efficiency of 54% has been demonstrated in tests. Delay in realization of satellite solar power stations (SSPS) is mainly due to the problem of lift costs: even for the lightest power plants which seem attainable, and for the lowest lift costs which a very advanced (non-shuttle-derived) launch vehicle could achieve, the economics of the SSPS seem to be only marginal.

Our studies indicate that the construction of SSPS units at the space colony, from lunar material processed at L5, should be economically quite competitive even from the start. The energy interval between L5 and geosynchronous orbit is small, so SSPS units built at L5 could be relocated rather quickly and easily in operational orbits, to supply energy for the earth.

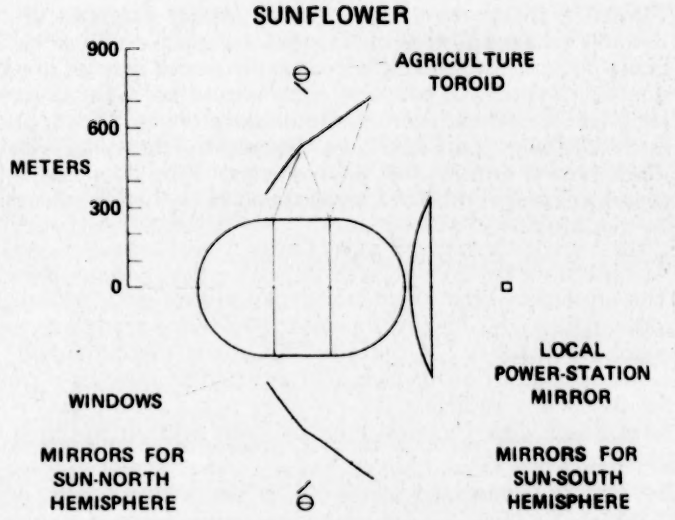
Construction of solar power plants at L5 would overcome four basic objections that have been leveled at the ground-launched SSPS concepts:

1) That they can demonstrate economic feasibility only if a whole series of goals can be reached, each within close limits.

2) That since those achievements could at best only be reached by pushing the state of the art very hard, there is no room for dramatic reductions of energy cost with further development.

3) Ground-launch methods depend critically on the achievement of very low lift costs to geosynchronous orbit. This would require development costs of some tens of billions of dollars, and the technology involved is not well enough understood that success would be certain.

4) In ground-launched SSPS concepts the entire weight of the power plant has to be carted up through the atmosphere. The quantities involved (up to half a million tons per year, if the SSPS program is to be of substantial benefit) are high enough that environmentalist objections, particularly regarding the ozone layer of the atmosphere, might be strong enough to hamper the program seriously, as has happened in the case of nuclear power.



10. A new design, developed by the 1975 NASA/Ames-Stanford University Summer Study on Space Colonization, for an initial space community. Its petal-shaped mirrors, its tracking of the sun, its reliance on solar energy, and its property of being a warm habitat for life in the cold of space all suggest the name "Sunflower." It could house a 10,000 person work force in a comfortable earth-like environment.

With construction at L5, the technologies of power plant development and of rocketry need not be strained. No advanced rocket vehicles are needed, and power plant technology of the present day (*Figure 5*) is sufficient. This contrast is evident in *Table 4*, in which the critical parameters of SSPS design and construction are compared for two earth-launched systems and for one built at a space community. In every case the target figure required for SSPS construction at L5 is more conservative than for either of the earth-launched systems, generally by a large factor.

TABLE 4
SATELLITE SOLAR POWER STATION
DESIGN PARAMETERS
(required for economic viability)

	Earth-launched turbogenerator (Boeing Aircraft Study)	Earth-launched photovoltaic (A.D. Little Co.)	L5 built turbogenerator (this report)
Power plant mass per unit power	5 Kg/Kw	0.8 Kg/Kw	10-15 Kg/Kw
Component lift cost from earth	$77/Kg	$220/Kg	($940/ Kg)
Efficiency of transmission	70%	$65%	55-63%
Interest rate	8%		10%
Busbar power cost (initial)	25 mils		15 mils

In *Table 4*, the lift cost from earth is not of great importance in the L5 construction case, because only a small amount of mass from the earth would be required in building an SSPS at L5. The figure listed is, though, the same one used for cost estimates of the construction of the space-colony itself.

The economics of SSPS construction at L5 requires a fresh viewpoint: in that construction almost no materials or energy from the earth would be required. The colony itself, once established, would be self-sustaining, and its residents would be paid mainly in goods and services produced by the colony.

In the summary which follows, the economic input to the combined colony/SSPS program is taken as the total development and construction cost of the first colony, the cost of lifting the materials needed from the earth for subsequent colonies and for non-colony-built SSPS components, a payment in dollars on earth of $10,000/person-year to every colonist, representing that portion of salaries convertible to goods and services on earth (for subsequent use on visits or, if desired, on retirement) and a carrying charge of 10% interest on the total investment (outstanding principal) in every year of the program.

The economic output (yield) from the program is taken as the revenue from power at busbar rates, initially 15 mils/Kwh. The SSPS plants are assumed to be in base-load service, at 95% utilization. To support that assumption, busbar rates are reduced at four-year intervals, to 10 mils/Kwh.

This should be regarded as only the first approximation to an accurate economic analysis. It is equivalent to discounted economics with a 10% discount rate. Knowledge of the input parameters is not yet precise enough to justify analysis in greater detail.

We have examined several cases, in each of which the first space-colony is used as a production site for construction of additional colonies as well as for solar power plants. This "regenerative" effect is essential: a real solution to national and international energy problems can only be achieved by the production of many, not just a token few, satellite power stations. For a high production rate the total number of space colonies must be increased, so that a total work force of 100,000 - 200,000 people in space can be maintained.

Figures 14 - 16 present the results of the analyses. In all cases, it was assumed that the construction of the first colony would require six years of effort, and that thereafter each colony could replicate itself in two years. This tripling of production rate represents devoting 4000 people of a 10,000-person colony to new-community construction (vs. 2000 people available at the construction site during the building of Island One) and in addition, an assumed learning-curve efficiency increase by a modest factor of 1.5.

The remainder of the work force, 6000 persons, was assumed to be committed to SSPS construction, and to produce two SSPS units per year. The productivity implied, 13-25 tons/person-year, is similar to that of heavy industry on earth. (The use of photovoltaic cells, if their progress makes them competitive, is not ruled out. Silicon, their principle constituent is abundant in the lunar raw material.)

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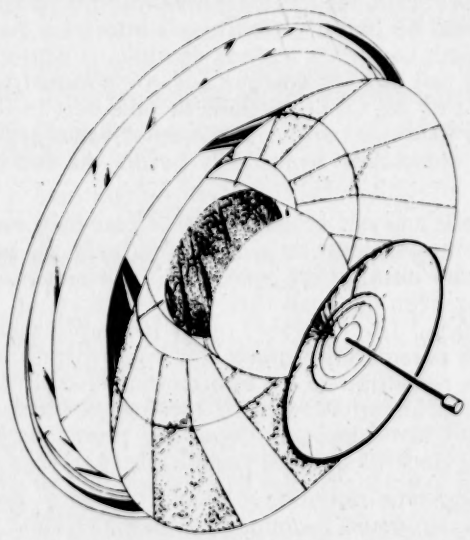
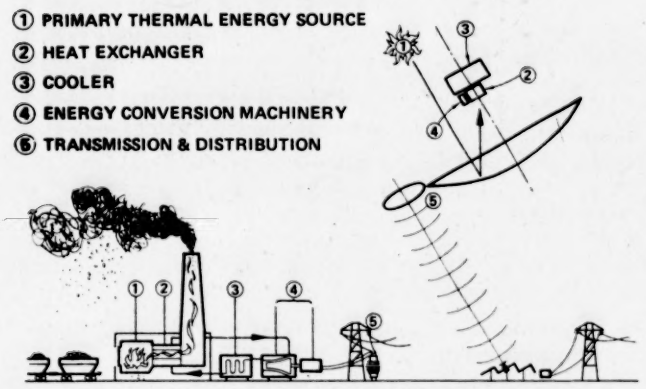


11. An angle view of "Sunflower." The interior circumference of the habitat could be over one mile. Agriculture could be carried on in an external, counter-rotating toroid, shown here as an outer ring.



12. Schematic of a satellite solar power system. The power plant shown, being studied by the Boeing Corporation, uses turbogenerator machinery. An alternative, based on photovoltaic solar cells, is under study by the A.D. Little Co., Raytheon, Grumman Aircraft and the Jet Propulsion Laboratory.

The question of productivity and the effects of automation within the weather-free, zero-gravity environment of a space community's assembly region deserves intensive study; so far it has been possible only to verify that the estimates given are consistent with earthbound experience. I anticipate that the residents of the early space communities will be nearly all employed in production, support services being automated as far as possible.

In *Figure 14*, a time-line is developed based on making an early start, with the shuttle and a shuttle-derived freight vehicle. A medium-to-high estimate (96 Billion Dollars) of the cost of Island One is assumed, and an additional 82 Billion Dollars for the transport of carbon, nitrogen, hydrogen and colonists to the later colonies is added. New-colony construction is halted after the 16th colony, due to market saturation.

By the 13th year of this program (the year 1995, given a starting date of 1982 for major construction activity, implying intensive design beginning by 1976) the L5-built SSPS plants could fill the entire market for new generator capacity in the U.S. Given the rapid growth of the manufacturing capacity and the possibility of busbar power cost reductions, true "energy independence" for the nations taking part in the L5 project could occur before the year 2000, with a shift to production of synthetic fuels. In the words of one exuberant young economist at the NASA/Ames-Stanford University 1975 Summer Study, "We can put the Middle East out of business!" In my own view, I would far prefer to see a cooperative multinational program formed, based on participation by all interested nations. If the L5 project continues to look feasible, it would be in the interest not only of energy-consuming industrial nations, but of the OPEC nations to take part in it, because if these numbers are correct, the market value of Middle Eastern oil could drop irreversibly before the end of this century.

A cost-benefit analysis of the *Figure-14* case has been made, and yields a benefit/cost ratio of 2.7. A favorable benefit/cost ratio also results from a variety of different input assumptions, with assumed total program costs up to 280 Billion Dollars. The favorable result is sharply sensitive to only two parameters: speed and interest rates. An interest-rate reduction to 8% approximately doubles the benefit/cost ratio; an increase to 13% reduces it to near 1.0. A stretch-out of the program would be disastrous as regards both energy benefits and the benefit/cost ratio.

Figure 15 indicates how rich a source of wealth the space-colony program could become. By year 11 (1993 on the fastest-possible time-scale) the energy flowing to the power grids on earth from L5-built SSPS units could exceed the peak flow rate of the Alaska pipeline. By year 17 the total energy so provided could exceed the total estimated capacity of the entire Alaska North Slope oil-field.

Figure 16 shows the effect of delay (as for example to develop advanced lift vehicles prior to space-community construction). The benefit/cost ratio would not be greatly improved, and total program costs would be reduced only by a factor of two, even if vehicle development costs and later operating costs would be delayed by the full 7-year development time of the new vehicles. This does not, therefore, seem to be a wise route to take, but requires further study.

THE U.S. AS ENERGY EXPORTER

The underdeveloped third-world nations are now trying to industrialize, in order to increase their living standards and economic security. If the example of the industrialized world is valid, their success in that attempt may be a powerful element in reducing the runaway population growth rates which now threaten their progress and, in the long run, political stability.

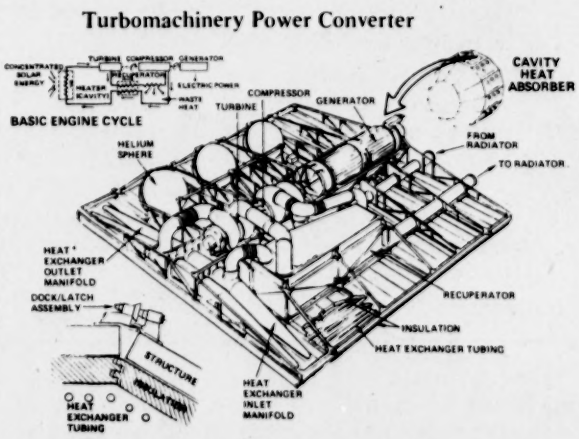
Because of widespread concern over decreasing energy and materials supplies, we are now viewed by many as exploiters of scarce resources. This has been a significant factor in hostility toward the U.S. and toward other industrial nations. With a program of power plant construction at L5 we could return, at little cost in energy and materials from the earth, to our traditional role as a generous donor of wealth to those in need. In this case the wealth we could provide would be in the form of energy to third-world nations, and ultimately of "beachhead" colonies for their own progress. The L5 project would give us the opportunity to act with generosity, yet with little cost to our own national resources.

RESPONSE FROM GOVERNMENT AND THE PUBLIC

It is a tribute to some remarkably perceptive men within NASA and the NSF that, despite their unfamiliarity a year ago with the modern concept of space colonization, they have now encouraged its development and have even begun to support it with a small amount of funding (approximately $40,000 in 1975).

For a person with a technical education, it is logical to assume, given a new concept, that "If I haven't heard of it before, it must be as far off as the 21st Century." Usually that attitude is justified. Space colonization, though, is a curious exception. It is a technical concept realizable without any new breakthroughs in materials technology or technical understanding. We are unfamiliar with it only because, until the Apollo samples were returned, no one could have put together all the necessary components of a space-colony program in the form of a complete system with defensible numbers.

In contrast to that situation, we have examples of development programs which do require breakthroughs in the understanding of new physical phenomena, but which have become accepted parts of our research effort simply because we have been hearing about them for a long time. One



13. Details of power-satellite turbomachinery. Total mass of the satellite depends strongly on the peak operating temperature of the system; for an earth-launched satellite, for which lift-costs are critical, the motivation toward high operating temperatures is strong.

classic example is hydrogen fusion power. It has been discussed in public for thirty years, and has been worked on in research for more than twenty years. In effect, it has become institutionalized. Although no responsible advocate of fusion power will commit himself as to when fusion power will become economically competitive, the idea has been around for so long that its eventual success is accepted as inevitable by most people. (My own view is that fusion power research should continue to be supported, on what I would regard as the off-chance that it might someday be competitive with L5-built satellite power stations.)

Space colonization, and the construction of satellite power stations at L5, requires no such breakthrough in the understanding of a new physical regime. It is mainly civil engineering on a large scale, in a well-understood, highly predictable environment. It does not even require the development of a new rocket engine. Some, fortunately a substantial number, of responsible administrators in NASA have been quick to grasp this distinction, and to see the potentialities of space colonization for the agency and for the public. For others, though, it has been almost an embarrassment, because the assignment of space colonization to its proper place in time-sequence (that is, now) implies that all previous planning has omitted an important option. In the case of NASA, proper recognition of the space colony concept is further impeded by the orders previously given to the agency, and never rescinded: to plan on constant or decreasing funding levels, to bring up no surprises, and as far as possible to become invisible.

The evidence of the past year indicates that in terms of public response space colonization may become a phenomenon at least as powerful as the environmental movement. Since the first small, informal conference on that topic, in May 1974, a rapidly increasing number of articles about it have appeared, in many newspapers and magazines, and all have been quite favorable. Several are still in press at this time. Radio and television coverage has also increased rapidly.

Popular response in letters to Princeton has been strong. Of these letters, more than 99% are favorable. Also, encouragingly, less than 1% of all mail is in any way irrational. Many of the correspondents offered volunteer help, and are actively working at the present time in support of the space-colonization concept. The letters express the following reasons why this concept, in contrast to all other space options now extant, is receiving such broad support:

1) It is a right-now possibility. It could be realized within the immediate future.

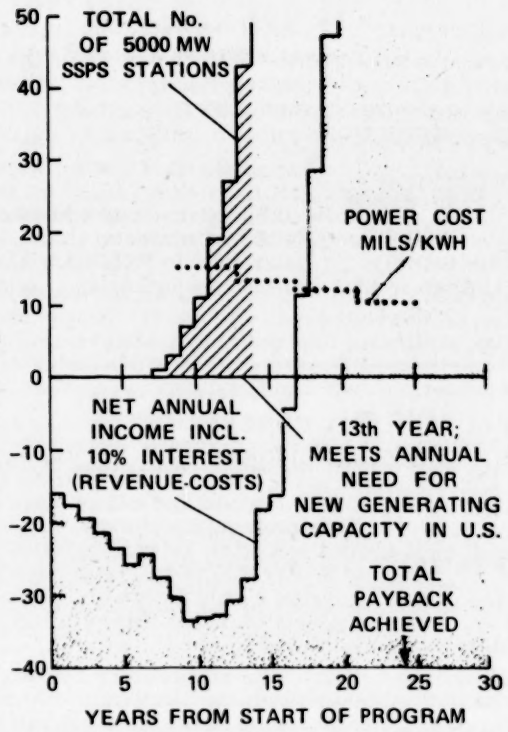
2) In contrast to the elitisim of the Apollo project or of a manned mission to Mars, it offers the possibility of direct personal participation by large numbers of ordinary people. Many of the correspondents, from hard-hat construction workers to highly-educated professional people, see themselves as prospective colonists.

3) In contrast to such technical options as the supersonic transport, nuclear power or the strip-mining of coal, it is seen as offering the possibility of satisfying real needs while preserving rather than further burdening the environment.

4) It is seen as opening a new frontier, challenging the best that is in us in terms of technical ability, personal motivation and the desire for human freedom. Many correspondents refer to space colonization by analogy to the discovery of the New World or to the settlement a century ago of the American frontier.

One letter, unusually well-expressed but otherwise not atypical, concludes:

"I would greatly appreciate being informed of your own personal assessment of what can and should develop out of your space colonization ideas. If they do in fact have the social and human potential that they appear to me to have, any unnecessary delay in their realization would seem to me to be unthinkably irresponsible."



14. Costs and benefits of a space-colonization program, based on conservatively high estimates for costs (178 Billion Dollars over 14 years) plus interest rates (10%). Cost estimates assume only shuttle-derived lift vehicles. A six-year construction time for the first community, and a two-year replication time thereafter, are assumed, with a productivity of two satellite power stations per colony per year after initial startup. By the 13th year, power plant capacity so produced would meet U.S. needs. In this scenario the benefit/cost ratio, including all construction, development and interest charges, would exceed 2.7. Power costs, initially 15 mils/Kwh, would be reduced in steps to achieve market penetration. Revenue would be obtained only from the sale of energy, not of power stations.

CURRENT RESEARCH

During 1975 the major events in space colonization have been the Princeton University Conference (co-sponsored by NASA, the NSF, Princeton University and the American Institute of Aeronautics and Astronautics; Cf. ref. 5 when available), and the NASA/Ames-Stanford University Summer Study on Space Colonization (ref. 6 when available).

Writing at the mid-point of the Summer Study, the principle results so far can be listed as:

1) Verification that shuttle-derived lift vehicles would be adequate for the establishment of Island One.

2) Verification that agricultural-yield figures used in ref. 2 were conservative by approximately a factor 2.

3) New, tighter requirements on allowable rotation rates.

4) Verification that productivity figures so far in use are in the right general range.

5) More detailed analysis of discounted economics, verifying a high benefit/cost ratio.

6) New, more detailed results in the areas of colony geometry, materials processing, and mass-driver payload guidance.

In the period since May 1974, when this concept first came to public attention, research on it has progressed at what I would describe as the fastest possible rate. In the year beginning in September 1975 this progress will slow unless some extraordinary mechanism is found to provide funding for in-depth studies to be carried out by the government agencies and the private sector. A level of 0.5 - 1.0 Million Dollars is probably adequate; to provide more at this time would probably result in some waste and inefficiency.

APPENDIX

(This section is keyed to the titled headings of the main text, and is intended for the reader with technical training, who may wish to check independently some of the most important numbers or statements).

INTRODUCTION

L5: An orbit about L5, stable in the four-body problem of the sun, earth, moon and colony, has been shown by Kamel and earlier authors. Cf. references in PTA (ref. 2). Occultation of the sun in that orbit is rare and brief. L4 is equally usable.

High-orbit products: The possibility of returning material products to the earth's surface from L5 is not considered in this document.

THE SPACE-COLONY CONCEPT

Authors: Tsiolkowsky in Russia, Bernal in England, and Cole in the U.S.A. all wrote books which bear on the concept of space colonies. Clarke, Stroud and others have also considered portions of the problem.

GEOMETRIES

The image of the sun's disc would rotate about its center, but the disc is so nearly circular that this rotation would not be detectable by the naked eye.

Civil engineering limits: A standard safety factor of 1.67 is used, as in the building industry on earth. (Corresponding factors are 1.5 for commercial aircraft, and as low as 1.2 for military aircraft.) For aluminum/silicon alloy, cold-drawn, with an ultimate strength of 60,000 psi, the yield point is 50,000 psi and the working stress is here taken as 30,000 psi. For hot-formed aluminum, 20,000 psi is used. The same safety factor is used for iron and titanium. Diameters up to four miles are assumed, with total atmospheric pressure of 5 psi minimum. See PTA for formulas. (Mass table in PTA for model 1 has a non-propagating error: for 20,000 tons aluminum read 80,000 tons metals.)

INDUSTRY

Axis of rotating habitat contains avenue-passage and passes through a hollow bearing. Bearing forces are small, typically one ten-millionth of colony weight in one gravity.

LIMITS OF GROWTH

M.I.T. Studies: Cf. references in PTA. Asteroidal materials: Total volume of proven asteroids is estimated as 1/2500 of volume of the earth (Cf. Allan, Astrophysical Constants). Economic imperative is construction of a new colony adjacent to an asteroid, so that economic productivity can be achieved without prior moving of materials. Relocation of a colony to L5 from the asteroidal region would require about 30 years at an expenditure of 7% of total colony mass.

ENERGY WITHOUT GUILT

The energy intensity (insolation) in space is 1.4 Kw/m^2, or 1.23×10^8 KWH/year for a 100 meter square. This would cost $\$1.8 \times 10^6$ at a busbar rate of 15 mils. The lower figure used in the text allows for reflection losses. Mirror assumed is .001 inches aluminum, with a factor three multiplier for support frames.

For an initial community of 10,000 persons, an electrical power plant of 100 megawatts is assumed (10 Kw/person). For the USA in 1975, average usage of electrical energy is at the rate of about 2 Kw/person, and peak capacity is equivalent to 2.5 Kw/person.

THE BOOTSTRAP METHOD

The velocity intervals from low earth orbit to lunar parking orbit (LPO), to L5 or to geosynchronous orbit (GSO) are all approximately equal, in the range 11.1 - 11.4 Km/sec for minimum-energy two-impulse burns. Escape velocity from the moon is 2.4 Km/sec. With kinetic energy = 1/2 mv^2, escape from the earth therefore requires 21.4 times as much energy as from the moon. Spiral orbits (low thrust) require more energy.

The mass driver: A description and table of parameters for this machine is listed in PTA. Further study results will be available in references 4 and 6.

Magnetic fields are held below 10,000 gauss, and accelerations to less than 29 gravities. The nominal repetition rate is 1 Hz, for payloads of 9 Kg each. The peak transfer rate is therefore 780 metric tons per day. The range of a factor 4 quoted in the text allows for turnoff during the lunar night, and for reliability down to 50%.

Guidance is by magnetic trimming during a one-kilometer inertial drift-space, roll/pitch/yaw and position sensing being done by laser interferometry before payload release.

In PTA an estimate of 10,000 tons for lift-needs from earth to L5 was given, and 3,000 tons for transfer from the earth to the moon, based on a "Spartan" approach: oxygen atmosphere, construction work force stay time until completion of the first community, and food supply in dehydrated form. Another extreme was given by NASA/MSFC, based on a nitrogen-mix atmosphere, extensive atmospheric make-up from earth, frequent crew rotation and food resupply in wet form. It was about a factor three higher (unpublished internal report, no number). The extremes are therefore 2% - 6% of an estimated 500,000 ton total mass.

In current discussions of vehicle-systems, a distinction is drawn between lift vehicles made of building-blocks each of which is already under development for the space shuttle (e.g., SRB's, SSME's, avionics) and lift vehicles requiring extensive new development. For the space-colonization program only the former are required. Several papers in ref. 5 (Tischler, Davis, Salkeld) cover this topic.

Construction station: PTA estimate was 1000 tons. A more detailed estimate (G. Driggers, ref. 5) gives 2500 tons.

LUNAR MATERIALS

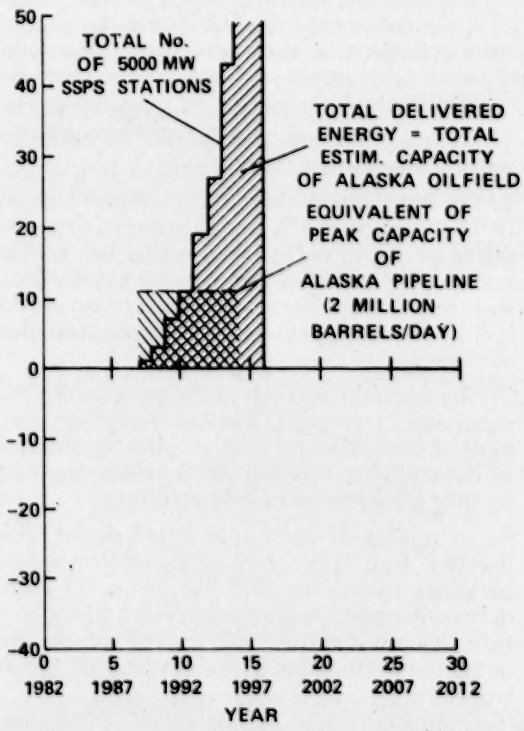
The source for Table 1 is ref. 7. Samples from other Apollo landing sites have generally greater amounts of aluminum and smaller amounts of iron. The lunar surface rocks often have higher metal content, but are neglected here.

The structural aluminum considered for use in colony-building is an alloy of aluminum and silicon, the most plentiful of lunar elements after oxygen.

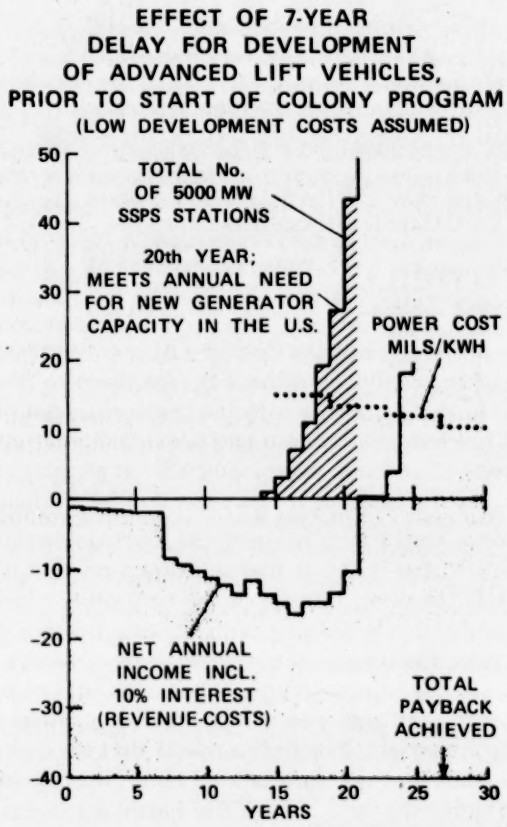
The fuel estimate made is based on the usual 6:1 oxygen/hydrogen mixture (fuel-rich) commonly used for LOX-hydrogen rocket engines.

D. Criswell (ref. 5) has calculated the yields of carbon, nitrogen and hydrogen which could be obtained by sifting lunar soils for the fine-grained material, and then heating that material. The rare light elements are concentrated in the finer grains, and can be extracted by that process. In this report no advantage is taken of that option.

Asteroidal materials: As noted earlier, the velocity interval from the earth to L5 is about 11.4 Km/sec. A selection of ten asteroids, whose orbital elements are well-known, was checked. It was found that in all cases the total velocity interval required for transfer to L5 was close to 10 Km/sec. Correction to match the orbital plane with that of the earth was an important term.



15. Effect of an early decision to drive toward space colonization at the earliest possible date. By year 11 from the start of the program the energy flow to the earth from satellite power stations built at L5 could exceed the peak capacity of the Alaskan pipeline. By year 16, the total energy supplied to date could exceed the total estimated oil reserves of the Alaska North Slope.



16. Effect of delay in startup, to wait for advanced lift vehicles. The most optimistic estimates for low development and operation costs for such vehicles are assumed. Total program cost is reduced only by a factor 2, for a factor 12 reduction in lift costs. Benefits, including energy independence, are delayed by 7 years.

ISLAND ONE

The design of Figures 10 and 11 has a habitat-interior diameter of 540 meters and a circumference of 1.05 miles. Total interior non-window surface area is over 900,000 m^2, about half of which is at 70% or more of earth gravity. The counter-rotating toroidal agriculture ring provides 400,000 to one million $meters^2$ for photosynthetic crop-growing, plus additional covered areas for processing and storage.

In order that the entire colony maintain its axis always pointed toward the sun, yet not require thrusters, the total rotational angular momentum must be zero. In the "Sunflower" design this is accomplished by devoting about 20% of the total mass to the agricultural ring.

The low-gravity work areas described are nominally 40 meters in diameter (412 ft. circumference or floor width) and can be of any desired length. Six of them, each 200 meters long, would provide approximately three times the total high-bay assembly area of the General Electric Large Turbine Division plant at Schenectady, New York, where a large fraction of the turbogenerator capacity of the USA is built.

COST-DRIVERS IN SPACE-COLONY CONSTRUCTION

Atmospheric composition: A typical design for a hemisphere diameter of 540 meters has the following contributions to total internal pressure:

Aluminum weight	3.2 cm	0.13 psi
Soil or structures weight	30 cm	1.08 psi
Atmosphere		7.50 psi
Total		8.71 psi

In this typical case the atmospheric pressure accounts for 86% of the total structural requirement. With a full 14.7 psi of atmospheric pressure the figure would be 92%.

COSTS AND PAYOFFS

In Table 2, items (a) and (c) are from the Exxon Corporation (Smithsonian Magazine, April 1975, p. 117).

Item (e) assumes a cost of 23 Billion Dollars as of 1967 and an average of 7% inflation since that year.

Item (f) is based on an unpublished NASA/MSFC Study Document, "Space Colonization by the Year 2000 - An Assessment."

Item (g) is from J.N. Wilford, New York Times, July 13, 1975, quoting Vance Brand, U.S. Astronaut.

Value added by location in high orbit: A fully employed population, a productivity of 20 tons/person-year, and lift costs in the range $100 - $400 per pound are assumed.

Busbar power costs: Present figures average 15 mils/Kwh for nuclear power, 17 mils/Kwh for fossil-fuel power. Peak-shaving power earns revenue at a much higher rate, but the energy generated by peak-shaving generators is a small fraction of the total.

Solar energy arriving on the land area of the continental U.S. averages about 1/10 of the amount which intercepts equal area in free space. For base-load power, the capital cost of the system must provide for a December/January day length, storage for extended bad weather, and a high demand.

Fifty-four percent efficiency has been demonstrated in 1975 by a JPL group, in cooperation with Raytheon (also Cf. ref. 8).

Microwave power transmission has its own environmental problems, but they appear to be less serious than those of nuclear or fossil-fuel power (Cf. refs. 8 and 9).

The velocity interval from L5 to geosynchronous (spiral orbit transfer) is 1.1 Km/sec and is in full sunshine. Transfer could be by a mass-driver, powered by the SSPS itself and used as a reaction engine. The reaction mass could be the wastes (for example liquid oxygen) from the industrial processing at L5. A transfer time of one month or less appears feasible.

Vehicle development costs: for an advanced (non-shuttle-derived) heavy lift vehicle, estimates of development cost from within the aerospace industry vary from 5 Billion Dollars to 25 Billion Dollars; of attainable launch costs to geosynchronous, from $77/Kg to $400/Kg.

The costs of SSPS construction at L5 (input for Figures 14 - 16) include lift costs for microwave transmitter magnets and initially for computers and controls, as well as items listed in the text.

Alaskan oil field comparison: 1 barrel of oil has an energy content of 5.24×10^9 joules (ref. 10). The peak capacity of the Alaska pipeline will be 2×10^6 barrels/day (ref. 11). For a high conversion efficiency of 48%, the pipeline will then supply 1.83×10^{18} joules annually. This is a rate of 5.8×10^{10} watts, or 58,000 megawatts, equivalent to less than 12 5,000 megawatt SSPS units.

The estimated total reservoir of oil in the Alaskan North Slope (the pipeline source) is 10^{10} barrels (ref. 11), or 2.1×10^{19} joules at 48% conversion efficiency. This is 134 SSPS-years, a total reached in the first nine years with the growth rates assumed for Figures 14 - 16. For comparison, the total proven reserve of oil in the Middle East is 33.8×10^{10} barrels (ref. 12).

CURRENT RESEARCH

One area requiring verification is semi-closed-cycle ecology. Many small islands have effective ecosystems more limited than that of the first colony, but verification is still required. Fortunately, total closure is unnecessary: "economic closure," the achievement of a closure level adequate to reduce to tolerable levels the lift costs for seeds, etc. from the earth, will be sufficient. Isolation and heat-sterilization can halt any runaway biological subsystem. ■

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"Is the surface of a planet really the right place for an expanding technological civilization?"

INTERVIEWING GERARD O'NEILL

Stewart Brand: What is the point of origin for you on space colonies?

Gerard O'Neill: My interest in space as something for people to be in, rather than simply to look at, goes back a long way. But the particular thing that started the space colonies concept, really, was a course that I taught at Princeton in 1969. It was the big, standard Freshman physics course, with about 320 students in it. "Physics 103."

I chose to do double-load teaching that whole year — my idea was that I would be the lecturer in that course, and I would also take a class section so I'd see the course from the top and the bottom at the same time. There were quite a few things that I wanted to do to improve the course. One of the things I felt most concerned about was that this was the peak time of disenchantment with anything in science and engineering. The students who were good at science, and particularly the students who were good at engineering, felt very defensive about it, because all of their friends and their roommates were saying that they weren't doing anything relevant. And I felt that, despite the bad times, improvements in the human condition could be reached by using science and engineering in the right ways, as opposed to the wrong ways.

So I thought it would be worthwhile, particularly for those few students who were so far ahead of everyone else that the ordinary coursework couldn't challenge them, to invite them to come to an extra seminar where I would try to find examples of problems to look at which could be of interest in their lifetimes, and which would be challenging on a large scale, and potentially very beneficial to the rest of humanity. And now having given you a non-answer to your question, I'll give you a complete non-answer, because I have to say that out of somewhere, and I don't know where, it occurred to me that the first reasonable question to ask was: "Is the surface of a planet really the right place for an expanding technological civilization?" And, of course, once you ask the right question, the right answer follows almost automatically. That's simply a question of working out the numbers.

SB: Now, this is how many students in the seminar?

O'Neill: Oh, not more than 6 or 8, I suppose. We met once a week for several weeks.

SB: You asked that question and what happened then?

O'Neill: Well, the students were able mainly to do library research, going and looking up in Encyclopedia Britannica how big the land area of the world was and things of that kind. I had to supply a good fraction of the calculations although they were able to do some of them, but within the time of the seminar I did encourage them to do calculations of how big could a rotating pressure vessel in space, to hold an atmosphere and provide a gravity, be made. That answer came back pretty quickly. It already started being interesting because it was several miles in diameter.

The reason is that if you're using the electromagnetic interaction — that is the ordinary interaction that holds solid matter together, instead of the very weak gravitational interaction (which is holding on to an atmosphere the difficult way, the way a planet does) — then you've got an enormous factor in your favor. What does that mean in terms of how much land area you can build with a rather small amount of material? The first answers that we came out with indicated that we were talking about more than a thousand times the land area of the Earth as the potential room for expansion. So those two numbers, the question of the largest structure size using ordinary materials and the question of what the limits to growth were, were enough to get me interested in the problem.

Another item that came in was energy, because it seemed pretty clear that solar energy was the obvious way to go. And also that if you were building large things, in the long run it would be better to do it in zero-gravity than in a planetary gravity.

SB: So, as I understand it, the question was asked, and the implied answer was, "No, the planet's surface is not the right place." And the implied next question is, "Where, then?" And then the answer was inside-out planets.

O'Neill: Well, the classical science fiction idea of colonization is always you go off and you find another planetary surface, like the moon or Mars. . . . That misadventure we sidetracked very quickly because first of all there just isn't that much area involved, and second, most of those other planetary surfaces are fairly unpleasant in terms of where they're located. They're the wrong distance from the sun, and they've got the wrong rotation times, and the wrong gravities usually. Besides all that, there was the fact that it didn't make sense once you could get out into the space beyond a planet to give up the fulltime solar energy that you could get if you just stayed there.

The sort of analogy that I like to use nowadays is to say that, "Here we are at the bottom of a hole which is 4,000 miles deep. We're a little bit like an animal who lives down at the bottom of a hole. And one day he climbs up to the top of the hole, and he gets out, and here's all the green grass and the flowers and the sunshine coming down. And he goes around and it's all very lovely, and then he finds another hole, and he crawls down to the bottom of that hole. And if we go off and try to get serious about colonizing other planetary surfaces, we're really doing just that. It's kind of atavistic but there really isn't any other excuse for it.

SB: I want to track a little more on the sequence of events for you and for the students discovering all this. You asked the question, . . . Were you already being electrified by all of this as it got started or did that come later?

Another midnight interview. Jerry O'Neill, his wife Tasha, Mike Phillips and I in a July ghetto apartment, till 2 am. Figuring that space colony details would be covered elsewhere, we concentrated on the life of the idea itself, now six years of age.

—SB

O'Neill: I was already. I started getting interested quite quickly. There was the question of how to make it as earth-like as possible, because certainly right from the beginning, my feeling certainly was, that I had no desire to go the route of just inventing a big spaceship or something that would be a space station. That had no interest for me at all. This was to be something that was to be potentially beneficial for a lot of people. It had to look an awful lot like the Earth. So, one of the questions I worried about quite a bit was how to provide earth-normal gravity, and a normal atmosphere, and a normal appearance of the sun as well. It was during that first few weeks I think that I came up with this simple geometry of the 3-fold symmetry of the mirrors and the alternating land and window areas, which so far still looks fairly reasonable in terms of the constraints that you put on it.

The fundamental thing, but one that didn't occur to me until quite a long time later – because of course my work on this was very occasional, a few minutes every few weeks kind of thing – was the question of how you cope with the angular momentum. The spinning cylinders are there, and it's sort of not very elegant to go throwing away reaction mass to try to process that angular momentum. But it wasn't until sometime later, I have to admit, that it occurred to me that the easy way was to make two of these things and to hitch them together.

SB: And they rotate in opposite directions?

O'Neill: Right. It should have occurred pretty quickly, because it's an awful simple-minded idea, but it didn't.

Mike Phillips: Does it occur in any natural form?

O'Neill: Well, again, if you ask the question in the right way, it should occur to you very well. I mean the wrong way to ask the question, and the way that I asked it first, was "How do you apply forces to a gyroscope to make it precess?" The right way to ask the question is "How can you have a rotating object that doesn't have any angular momentum?" and then you get the answer immediately. That's easy to say after the fact.

SB: Was there a point or a series of points where the practicality started to overwhelm you?

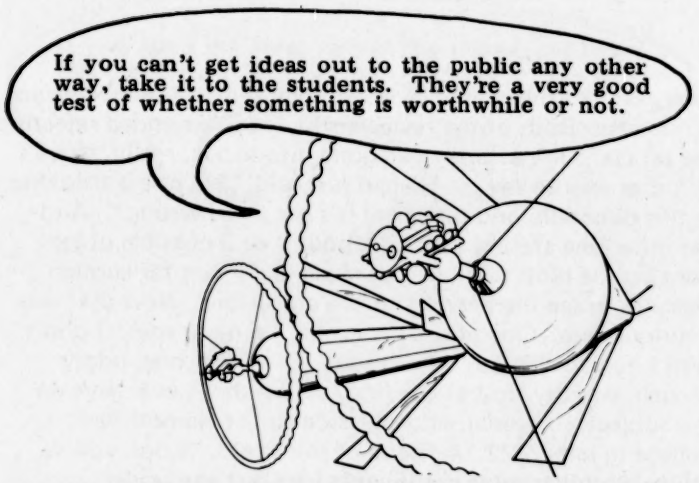
O'Neill: I think I began to realize, really, within the first month or two that this was, in my opinion at least, something very important. And that I somehow had to get it out into the open and get it discussed. But then, as you probably know, it was a long and very frustrating period before anything really came out on it. I talked about it a little bit to some of my friends. I used to talk about it to my children. I'd take them on walks in the woods, and speculate about what life in a space colony would be like. In fact Tasha came to one or two of the seminars at that time, because we had met only within weeks of that same time.

SB: Were you electrified, Tasha? Or was this just something he was doing?

Tasha O'Neill: Well, at first it was beyond me, anyway. I had just come from Europe and I didn't understand anything anyway. And I didn't understand anything about physics. And then, you know, time went on, and it took hold of me too. I understand far more by just listening over and over and over . . .

O'Neill: You'd be surprised to hear her explain angular momentum now.

SB: Let me pursue this, because I am always interested in how ideas take root in a person and then in society. So here you are now with what must be a gradually increasing obsession and not many listeners. Did you take a strategic approach in any way? Or just keep talking and let things find you?


If you can't get ideas out to the public any other way, take it to the students. They're a very good test of whether something is worthwhile or not.

O'Neill: It was awfully irregular and unplanned. I spoke about these things with a few friends and at one party, in the home of some friends. There happened to be someone who was associated in an indirect way with one of the magazines and that lady got very interested and excited about this and suggested that I write up an article for the magazine. And that seemed to me to be a worthwhile idea so through her, the magazine editor and I got in touch, and at his suggestion I went ahead and wrote an article.

SB: What magazine? What editor? What lady?

O'Neill: I think that was **Atlantic**.

SB: That's the East coast phenomenon, Michael.

O'Neill: What's the East coast phenomenon?

SB: That publishing occurs on the East coast. If you were in Nebraska, you'd still be there.

O'Neill: Well, the reaction was – the editor was quite interested and he wrote back and asked an enormous number of questions, and then I expanded on the article, answered all the questions, and sent it back again. Again, long months went by and finally he rejected it and said, "It's not that I'm not interested, it's just that I have this feeling that I've asked ten questions and you've given me ten answers and now that suggests a hundred more questions, and it's not going to converge somehow. Better that I not do anything about it."

SB: That's the difference between our magazines. **Atlantic** converges; we don't.

O'Neill: So then it went through a period of – let's see, that was 1970, and it was not until four more years that I was able to get an article published.

SB: All this time you're just muttering to friends?

O'Neill: No, I kept on. I rewrote the article again and . . .

Tasha: Collected rejection slips.

O'Neill: Yes, collected rejection slips. I wrote a letter to **Scientific American**. I didn't send in the manuscript, but they had published 2 articles of mine previous to that, so . . .

SB: On what?

O'Neill: Subjects of physics. There was an article on spark chambers, which was a technique of high-energy physics which was in vogue in the 1960's, and an article on particle storage rings, which happened to be something that I'd started. So I wrote an historical article about that in the 60's. And since I had written for that magazine before, why I felt that it might make sense to try them again. So I wrote them a letter suggesting an article on this topic, and just in a couple of paragraphs outlined what had been done. And I got a very stuffy letter of rejection back. I think it was two lines, and sort of immediately dismissed the whole thing. They didn't even want to look at a manuscript.

So then I rewrote it again and that time I tried **Science**. And that rejection was curious and more complicated. In all of these cases, of course, the time to accumulate rejection slips was very long. You know, many months would go by, in

each case. In the case of Science, they sent me the reviewers' comments. Both of the reviewers had recommended rejecting the article. One of them had gone into shock, really, there's no other way to say it. He had just said, "No one is thinking in this direction, and therefore it's got to be wrong." And the other one started to think about 2 or 3 possible objections but he didn't let his own mind carry him far enough logically to see the answers to the objections. Now that was a curious case. One of the reviewers, I'd never met. I don't even know to this day who it was. The other one, oddly enough, was my host at the first lecture that I ever gave on this subject. It was an odd coincidence, at Hampshire College in late 1972. A friend of mine said, "Look you're having all this trouble getting this idea out and under discussion, take it to the people. Give some talks at universities. And if you can't get the ideas out to the public any other way, take it to the students, they're a very good test of whether something is worthwhile or not."

SB: This is what Buckminster Fuller did a while back when no one was buying. He went to students, and students bought, and then everybody else bought.

O'Neill: Well this fellow said, "Look, come and give the talk at our college" — this was Hampshire. And so I went up there in late 1972, and the man who was the dean of the engineering college, the college of science, was the host. The talk itself was a lot of help to me because it was an 8 o'clock in the evening lecture, and I talked for less than an hour, and then questions went on for more than an hour after that, and the students were very excited about it. Finally after something like 2 or 2½ hours had gone by, the host got up and said two things. "First," he said, "I want to say that when I first heard this idea I thought it was complete nonsense, and now I want to tell you that I've changed my mind. The second thing is that the speaker has an 8:30 class tomorrow and a 4-hour drive to get to it and we really have got to give him a chance to get to sleep. So let's just let those few people who want to ask questions, continue asking questions." And what happened was that about half the audience left, and the rest proceeded to take chairs closer to the front, and the whole discussion went on for about another hour.

When I left with my host to go back to his place to sleep the few hours that remained, he started asking me some very elliptical questions that I couldn't understand at first. He said, "You had all of these rejection slips now for all of these years. Does this personally get to you? Is this something that is personally threatening to you in some way?" And I laughed and said, "No, it doesn't. First, I really think that what I'm doing is worthwhile and, second, this is something completely beside my normal work, and I don't have any trouble getting my ordinary work accepted. I don't have to worry about my job and so on. So that I don't feel personally threatened by it at all. I'm sorry that people are so slow to catch on, but that's my only reaction." "Well, it was important to me to ask that," he said, "because I want to tell you that I was one of the reviewers who turned down your article for Science." And he said at that time that he would write to the editors of Science and tell that he had changed his mind.

SB: Very nice. Did that then have some effect on Science?

O'Neill: I never got any direct reply from them on that. There was another man later on who got quite interested in that work who wrote them and I got a very stuffy short note from the editor, saying that in view of this suggestion that they would reconsider if I wished to resubmit the manuscript. By that time, Physics Today had already agreed to publish the article, and I wanted to be loyal to the first people who had gone out on a limb and said that they would be willing to publish this work.

SB: That was the first major publication . . .

O'Neill: That was the ONLY publication. The article was accepted about the beginning of 1974 and published in September of 1974. So there was a period of approximately four years during which I was trying to get it published and couldn't.

SB: As this was going along, and before you talked with students at Hampshire were there friends of the idea that were sort of helping you stay afloat about it? Or were you pretty much all alone in your enthusiasm?

O'Neill: Well, there were personal friends whom I talked to, and who got quite interested and enthusiastic about it, but it was a sort of word of mouth thing among comparatively few people. And then I did start giving other lectures in colleges. — The second lecture was at Princeton. And I gave talks at quite a few colleges on the West coast in 1973. But that already represented a passage of about 3 years of time.

SB: Is this with graphics and slides and things like that? Or straight. . .

O'Neill: I had some fairly primitive graphics.

SB: During this time, how much were you actually working on the idea itself, refining it?

O'Neill: Very little. It would be a question of if I were in the course of a working trip someplace and had to spend a day or a night in some city where I didn't know anybody, I might work in my hotel room or I might spend a Saturday on it, or the middle of the night, or something like that. That was all the time I had.

SB: So the Physics Today article, which was basically the same original article, slanted for . . .

O'Neill: I think it was about the 6th or 7th draft by then, but the ideas were basically the same. It had been improved and a whole lot of detail had been added, and of course as you say it was for a different audience. The original article had been written for a popular audience.

SB: Then what was the response to the magazine article?

O'Neill: It was very strong. But already between the time that the article was accepted and when it actually appeared, you see, there was the May 1974 Princeton Conference, and that really was when the concept got known to a fair number of people.

SB: Because of Sullivan in the New York Times?

O'Neill: Yes, And then the articles that followed from that.

SB: Michael where did you come into the picture? And how?

Mike Phillips: Jerry, you wanted to talk to somebody at POINT Foundation.

O'Neill: Yes. I wanted to have a little conference, and try to get some people in to talk about this and see whether there was anything fundamentally wrong in the ideas. And I thought, Well, look, we could probably put on the conference with no budget at all, in some kind of way. But darn it all, it ought to be possible to get a little bit of money to do a few things that would make it better. So why not waste the few hours to become educated in the question of how you go about getting money to do something which has not been done before in our society. And so I started calling foundations. And I very rapidly found that no matter what it says in the title of any foundation, and no matter what people may say about a foundation — that it's always looking for new ideas and things like that — it's really not true. The only

kind of new ideas that foundations are looking for are those that follow directly along the lines of things which are already in the mainstream. And I got personal interest from a number of foundation executives, and so on, but not a penny of money from any of them.

SB: This is how many foundations you're talking about?

O'Neill: Oh, I must have tried 8 or 10, something like that. And then someone suggested the POINT Foundation.

Phillips: Probably David Hunter.

O'Neill: I don't know who it was, Mike, it could have been. Stern Foundation sounds familiar. Then I got in touch with Richard Austin, which was not easy, by the way, because it came by way of the Portola Institute. He had moved and now he was in San Francisco, and there was a sequence of following telephone numbers, and so on. Finally I talked to him, and he was his own absolutely unchangeable self and, you know, very genuine and very open right from the start. So that was how we set up that appointment with you and Richard and me.

SB: You were out here anyway or flew out for that?

O'Neill: No, I was out here anyway in connection with my high-energy physics work. There was no budget, so I couldn't go any other way. So, Mike instantly understood what I was talking about, and I gather you were almost out of money.

Phillips: It was getting down there, it was almost near the end *[mumble]* . . .

O'Neill: So you came up with the famous $600 dollars and that was what funded the first conference.

Phillips: I just got that figure out of the air.

SB: So the WHOLE EARTH CATALOG is responsible for the colonization of space *[giggle]* .

Phillips: I didn't give it to him without restrictions though. You see, I thought they ought to go through Princeton. That Princeton had to accept it. The grant to him wouldn't be nearly as . . .

O'Neill: I think it had an excellent effect. In fact let's trace that effect. You see, it had never occurred to me to even talk to reporters about this. Our idea was, we'll invite a few friends, and we'll have a little conference. And because that was handled as an official university grant, a certain amount of boiler-plate went along with it. Part of that boiler-plate was that a statement of that grant came across the desk of the University Publicity Office. They automatically sent out a university publicity release on it, and that was the reason why reporters came down to the May conference, and articles started getting written.

SB: What reporters did you get?

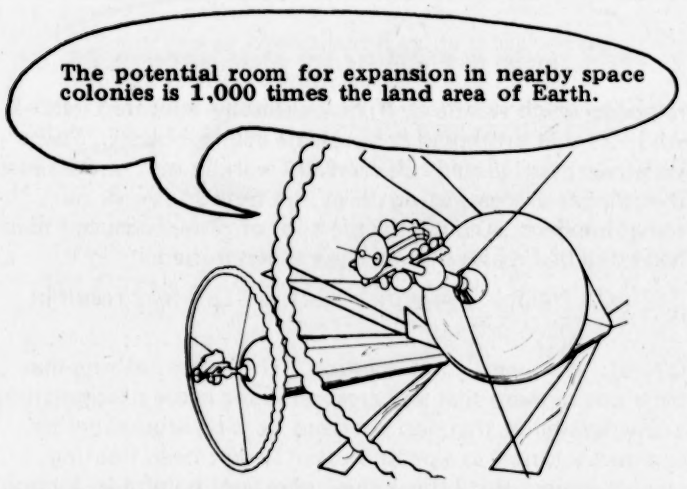
O'Neill: Local ones, and Walter Sullivan came down from the **Times**.

SB: Do you happen to know what drew him down?

O'Neill: I think he's a good conscientious reporter and science writer, and there must have been something in it that interested him, but beyond that I don't know. Incidentally, I think he may be opposed to this idea now. The latest that I've heard is that he is personally somewhat negative on it, though he continues to report the work accurately and fairly.

SB: So, this was May 1974. The conference included who?

O'Neill: We had, let's see, Gary Feinberg, from Columbia, and Eric Hannah, who was a graduate student at Princeton at that time, and Eric Drexler, who was an undergraduate



from MIT, who had found me rather than the other way around, incidentally. He's a very interesting guy. And we had Joe Allen, a young NASA astronaut, who presumably will fly some of the shuttle missions. Joe had learned about my work quite indirectly. He had talked to someone who had been to a lecture that I'd given on the West coast. I think Cal-Tech, or something like that. So Joe was interested and he came up to the conference. And then there were two people from NASA headquarters, and one of them was in the advanced launch vehicle division of NASA, Manned Space Flight office. He was very helpful because he gave us some initial estimates of launch costs. Those are still within a factor of 1½ the same numbers that are being kicked around now, so we had already the basic answers from him at that time.

SB: It was just one day? Was it papers, or people chit-chatting, or what?

O'Neill: Well, it was really two days because we had people come in on a half-day on Thursday. Perhaps 10 - 15 of us, just sat quietly around some tables and tried to review some of these ideas and get in hand how these papers would mesh, how these informal talks would mesh on the following day. Freeman Dyson came on that day, and Freeman got very interested and he stayed for the whole conference in fact. Dave Anderson, a student from Columbia; George Hazelrigg from Princeton in the Aerospace Engineering Dept. So the first day was just a few people sitting informally around a table, and then the second day was open.

SB: So there were a reporter or two there, and Sullivan did what with it in the **Times**?

O'Neill: He wrote, I think, a very good article, which the editors of the **Times** chose to put on the front page. He called a few days later. He said his first reaction was to be surprised, Gosh, that they had put it on the front page, and then his second reaction was, Well, why not? So, then, everybody sort of picked up on it from there, and there was an article on it in **Time**, and lots of interview requests. The BBC was on the phone within a day or two, and CBC and various New York stations and so on, and stations out on the West coast.

SB: And you were doing the interviews?

O'Neill: I was doing the interviews. That was still in a time which I had the time to be able to do the interviews that got asked for.

SB: So there was a media flash for how long?

O'Neill: Well, it really never stopped. The Associated Press did an article in the summer of '74, quite a good article. Howard Benedict was the reporter, and he took care to check his facts very carefully. It was quite a good job. The Los Angeles **Times** asked me to do an op-ed piece, which I did for them, and they had it illustrated reasonably well. And since they're part of the L.A. **Times** - Washington **Post** syndicate, that got picked up by papers in many different places in the country. And then the **Physics Today** article came out in September. That prompted a large amount of

response which was more from technically educated people. And also that prompted some of the counter-blasts. There were two that I would call carefully worked out, in the sense of someone at least sitting down and trying to work out some numbers. And it took me a lot of time, because I then had to sit down and answer these things in detail.

Phillips: Were they creative? Did they result in new forms for . . .

O'Neill: It's a very good question. There was nothing that came out of them that was creative in the sense of suggesting a new possibility that had not been floating around earlier, or a new solution to a problem that hadn't been floating around earlier. But I think they were very helpful in forcing me to go into detail and justify on a numerical basis things which I hadn't taken the time to calculate, because I just had had a sort of hunch that the numbers would work out all right. I think that I certainly learned a lot in terms of additional insights into, say, how the economics of the whole thing might go than I would have without those criticisms. So it was probably quite worthwhile. Then, let's see, there was the **New Scientist** article — that was in late 1974.

SB: You said then there was a second Princeton conference. When, this May?

O'Neill: That's right. We've been trying to measure in some way the exponentiation time for the whole thing, and at the second Princeton conference I just made a hasty calculation that during the last year the exponentiation time was something like 3 - 4 months.

SB: "Exponentiation time" being what?

O'Neill: Time in which some level of interest, activity and so on is growing by a factor of e.

SB: "Factor of e" being what?

O'Neill: 2.71 . . . Pocket calculators would automatically think in those terms too. Physicists are just used to it. So just for fun at that time, off the cuff, I tried to think of the ratio of the funding level of the 1975 Princeton conference which as far as I'm concerned will be the last one it will be necessary to hold of this general introductory types, to the funding level of the first one, which you paid for, or YOU *[readers]* paid for, depending on how you want to measure it. And the ratio was something like 14 or 15, and so working out the exponentiation time, it was just about four months. I'll admit that's a silly way to try to measure something.

Phillips: The NASA Ames study is a hundred thousand dollars. May at Princeton was $12,000.

O'Neill: The big crunch will come now, because we're at the point where you have to sit down and do some serious studies. Bunches of people getting together and waving and shouting is not going to push the thing along. At this point you really have to do your homework and have serious, specific research which runs for a year or more, and on a much more fine-scaled set of topics. To do that right would take something between $500,000 and $800,000, I would say, spent over the next year. And I cannot imagine any way within the present set up of the government that that money could come out. Because the 2-year funding cycles that you normally have just don't permit that.

SB: Summarize briefly what came out of the second Princeton conference, and what you expect to come out of the summer at NASA Ames.

O'Neill: Well, the NASA Ames study, I'm not sure what will come out of that, because that really is not a directed project study in the same way that the previous work has been. First of all it's funded out of the American Society of Engineering Education through a NASA grant, a continuing thing. It's really intended to be an educational process for young faculty members, not for aerospace professionals by any means. They came in for the summer with the intention of going through an exercise in systems design, and many of them arrived on the scene knowing next to nothing about the whole subject. So it's mainly an educational process. The challenge is to obtain a serious design study from a formal setup which is non-directive and quite different in outline. So far the Ames study is doing quite well, given its limitations.

SB: In a sense this is like your original seminar.

O'Neill: Maybe so. The Princeton conference got us quite a bit farther, because that was a directed kind of thing where we had about 25 or 30 invited speakers, each of whom prepared a paper on a given topic. I think we can now make some fairly definite statements: one is that as far as the quantity of material that does have to be brought up from the earth — that is, what you need to give you the stepping-stone, to establish this sort of first beachhead in space — the costs, numbers and sizes of the vehicles involved are well within what people can do in the 1980's timeframe. They don't require anything more advanced than the space shuttle and the sort of vehicles that you could easily develop from it. There's nothing super advanced involved, no nuclear-powered rockets or anything like that.

The second solid thing that we could say is a consequence, not just of the Princeton conference but also of a lot of very thoughtful letters and calculations I've had from various people whom I would never have known about had it not been for all the publicity that's come to this business. The agricultural numbers that I used in **Physics Today** now seem to be very much on the conservative side. You could probably do quite a lot better than that in terms of yields per square meter to support people. But that's okay. We are farther along on the question of design of the mass-driver, which is really crucial to the whole thing. It's the electromagnetic machine for bringing lunar surface material from the surface of the moon up to the colony site. That's extremely important because practically all the material for the first colony, and everything for the products that it produces has got to come from the moon. There I would say we're somewhat further along now than we were a year ago, we seem to be qualitatively okay, and even quantitatively in terms of the basic details, but a lot of calculations still have to be done. And we are somewhat further along in terms of guidance methods and things of that kind. That's the sort of thing where nothing less than a serious, quiet study where four or five people sit down full-time on this subject for several months or a year would do the job.

And we had an interesting paper on Space Law. Apparently the building of the first space community would fit within all of the international treaties if you stick to, as I recall, three conditions. First thing, it's got to be non-military. The second, that if anything interesting, new research, comes out of it, like information about the surface composition of the moon or something of that kind, that it does have to be made available through the United Nations to anybody who wants the information. And the last is that, at least in some nominal form, the community has got to be under the jurisdiction of the nation or group of nations which establishes it. You cannot, at least deliberately, send people out to be absolutely on their own.

SB: So there's a funny point now between the Princeton conference level and the next serious study level. What's your expectation as to how it will actually proceed over the next couple of years.

O'Neill: Well, we know that our support from NASA (which is small, but enormous by the standards of what we had just a year ago) is going to be continued and increased somewhat for this next year.

SB: Will you be administrator of that?

O'Neill: It's such a tiny thing, there isn't really much administration involved. Yes I'm the, whatever it is, the — I forget the title I'm supposed to have. It's the usual thing; you have to be responsible for these things.

SB: Are you getting any kind of on-going cadre of people tending to track along with the project?

O'Neill: Oh, very much so.

SB: There's how many people now?

O'Neill: Again it's a question of the level of involvement. There are now at least 15 or 20 people who are spending some significant fraction of their time on a volunteer basis, working on this, unpaid entirely. Some of them are spending quite a substantial amount of time that way. There are a very much larger number of people who have written offering to help if there's some way that they can within their limitations; they've got full-time jobs to hold down. So far I've felt that I ought to put out the newsletter myself.

SB: The newsletter, what's that?

O'Neill: It doesn't cost anything, you just have to write to my address in Princeton, and the secretary should send the newsletter. There's one coming out now. I just finished writing it. Prof. Gerard K. O'Neill, Physics Dept., Box 708, Princeton, NJ 08540.

SB: You're still being basically a high-energy physicist?

O'Neill: Oh, yes. There's no real government commitment, for example, to push this program hard at this point. I've spent many years building up my little group in experimental high-energy physics and I'm certainly not about to tear it apart in an unstable moment like this.

SB: What would it take for you to become a full-time space colonizer?

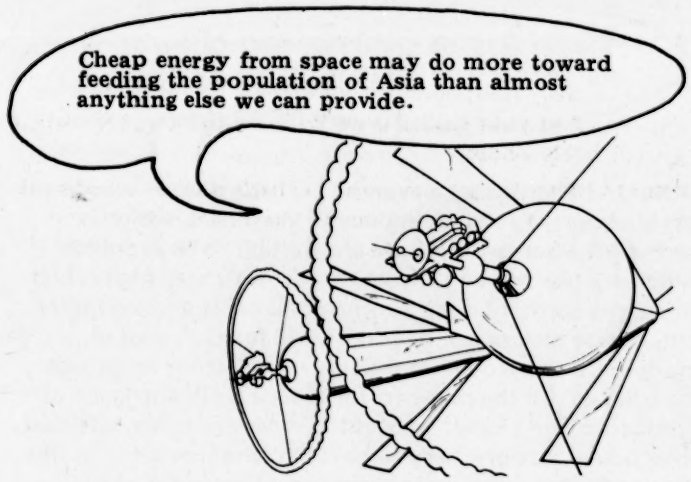
O'Neill: Well, if the president came to me and said, "Here is X-billion dollars, we're going to go ahead with the thing and we want you to be involved with it." That would sure fetch me.

SB: Suppose NASA said, "Here's 5 years of personal salary to administer the growth of this program"?

O'Neill: That's not enough. I have a deep suspicion of governments, and really — although I'm not politically active — I know enough about politics to be very suspicious of it; I think I would have to see a really substantial committed kind of program going. I don't mean at the spending level of billions of dollars, but I'd like to see something where there's a very solid commitment to continue in the same sense as there was in the Apollo program.

SB: Of the level of Kennedy saying, "We're going to be on the Moon in this decade." For some politician to make this go, he's going to have to say "by the year so-and-so." What year is that?

O'Neill: Arthur Kantrowitz, the president of AFCO-Everett was out visiting us a few days ago. He happens to be quite enthusiastic about this work, and he says that his answer for things of that kind is to say, "You'll have the result ten years after you've stopped laughing," which is I think, a pretty good answer. The most responsible answer I could give is to say that if I really had the responsibility for getting it done by a certain time and the authority to do it



in what I would consider the right way, then I would be willing to make a very strong commitment that it could be done in 15 years from time-zero. Whatever that time-zero is.

SB: This is Model One with an extra-territorial population of what?

O'Neill: Yes, Model One. Roughly 10,000 people. If you look at the growth rates that you could get from that first one, then you'd probably be talking about a quarter of a million people by the year 2,000. Because you'll be going up very fast after you get the first beachhead.

SB: And your graph I saw in Washington suggested a net population decrease on the planet's surface by . . .

O'Neill: I think the turn-over there is about 2018. Now that was based — first of all, I don't make it as a prediction — it was indicated as a technical possibility, and it was based on a time-zero of essentially now, which is certainly unrealistic politically, and a completion date of 13 years, so that would put Model One in place by 1988. Maybe you could even do it from now, technically, but it's probably more reasonable to say 13 - 20 years from a time of decision.

SB: Do you think there's no way to get the tooth-paste back in the tube at this point. . . . that the idea is inevitable?

O'Neill: There are other possibilities. Civilization could tear itself apart with energy shortages, population pressures, and running out of materials. Everything could become much more militaristic, and the whole world might get to be more of an armed camp. Things of this kind might just not be done because no nation would dare to divert that much money away from military efforts. Or without war, it could be that the world will become poor, to the point where it can't afford to try things like this.

Of course, if neither of those possibilities occurs, then I do think there is some sort of inevitability about it. With that, of course, you can't associate a time-scale. It could be a long time.

SB: Who resists the idea in any large way? If anyone.

O'Neill: Well there was a while when I thought that elderly and famous professors of physics were the greatest opponents . . . In fact of all the mail I've gotten only about 1% has been in opposition to it.

SB: And what's your short roster of planetary problems that will be solved by this particular technique? Energy, population . . .

O'Neill: Well, yes, but by phrasing the question in that way it's difficult for me to answer except with a prediction or promise, and that's something that no decent scientist likes to make. I think it's very wrong to assume that something like this is going to promise happiness to all people, because people manage to make themselves unhappy in almost any circumstances.

SB: Well, now I'm going back to '69 when you and your students were on the defensive about relevance.

O'Neill: "What's the relevance?" That's a fairer way to ask the question. From the economic viewpoint, which is perhaps the narrowest, there are starting to be products which are needed, and whose end use is in very high orbits above the earth, like geo-synchronous orbit or even father out, escape distance or beyond. And for that class of products, a space community has a very strong advantage. We tried to run the numbers for several different kinds of products of that kind: processing lunar materials, satellites, solar power stations, very large radio telescopes, things like Project Cyclops, something that would listen for extra-terrestrial civilizations. We concluded that you could do Project Cyclops for 1/10 the price if you built it at a space colony, rather than on the earth. And things like large space-research vessels for going out to the outer parts of the solar system with a large research team, hundreds of people – very much in the spirit of Darwin's voyages. Exploring the planets in detail is something where you'd go out with a ship of several hundred people, that would be a self-contained community. It would be able to run for several years, and would go into orbit around one of the outer planets and send down small vessels to take samples and do surface explorations. You'd be doing your data analysis in real time, and any startlingly important results you would be beaming back to the vicinity of the Earth immediately. The detailed tapes you'd carry back at the end of the voyage.

One of the ideal industries for the community at L-5 is ship-building, because if you're going to build a big ship that's going to be in space, it's pretty absurd to build it at the bottom of the hole that's 4,000 miles deep and then try to haul the pieces up. As far as the satellite power stations are concerned, again we're going through the numbers, but it looks as if it can be done that way very much more cheaply than it could from the surface of the earth, again, because you're using lunar materials which can be obtained at low cost. Having cheap energy may do more toward feeding the population of Asia than almost anything else we can provide.

One product that can be built, once you have a first colony there, is more colonies. You can construct a community which is self-contained in terms of all of its basics, of relatively small size. You're not depending on a food distribution system that's a thousand miles long, for example, as we do here on the Earth. Or an energy distribution system that's 7,000 miles long, as we do here on the Earth. Suppose that all of those essentials were obtainable over a distance of only ten miles, and by a population which was as small as ten thousand or a hundred thousand. I would think that in the long run, the tendency toward community diversity, the diversity of governments, diversity of the ways people choose to live, the kinds of architecture that they choose to have, and so on, would be enormous. Which is, I think, in exact contrast to the way that things are going on the surface of the Earth at the present time. And I believe that if someone were to look back on this whole business from the vantage point of say a hundred years further in time, probably the economic factors, which loom so large to us, will seem then to be relatively unimportant, because they won't be able to appreciate from their presumably much wealthier vantage point, what our problems were like. But the question of diversity and of the opening up of new possibilities and new frontiers, both of the body and of the mind, I suspect will come to be regarded as the most important contribution that these ideas have made.

Phillips: I wanted to ask about the conference. What papers, or what people were the most exciting, or the most interesting?

O'Neill: That depends an awful lot on your point of view, of course. Naturally, I was most concerned over those speeches which bore directly on the question of the validity of the calculations that we'd been making up to the present time. So from my point of view, two of the most important papers of the conference were those by Hugh Davis of Johnson Space Center, and Del Tishler who was formerly at NASA headquarters. And those were very straight-forward launch vehicle papers, which might not be so exciting to someone who is interested in sociological questions for example.

Phillips: What about the materials talks?

O'Neill: Materials? There was a good talk by David Criswell, from the Lunar Science Institute in Houston, and it looks as if from the Apollo samples of lunar rock and the additional information that Dave was able to give us, we're in quite good shape for metals, glass, oxygen. We already knew a year ago that we don't have good sources of carbon, nitrogen, and hydrogen $_6$ on the surface of the Moon. Dave went through an exercise which seems to indicate that we could, if we want to, get enough hydrogen out of the lunar surface by preselecting fine-grain material before we send it heating and processing a greater quantity of material than the amount out to L-5.

SB: It is my understanding that the lunar material is not what anyone would call ore in any Earth sense.

O'Neill: It's not so bad. There are lots of places on the earth where 1% ore is regarded as relatively good these days. And there are large areas of the lunar surface where just the ordinary dirt that you pick up out of the ground is as much as 10% aluminum, and around 30% in total metals.

SB: How does that compare to bauxite?

O'Neill: Not as good. Bauxite's a richer ore than that. But that's becoming a scarce resource. The Bureau of Mines is already conducting studies, some of which are up to the pilot plant stage, for the processing of some ores which turn out to be identical to the ones we would have to work with on the moon.

SB: Does working in vacuum in 1/6th gravity give you any advantages in working the ore?

O'Neill: Well the vacuum environment of the moon is vital for the question of low shipping costs. The mass-driver, the electromagnetic machine, can only work efficiently in vacuum. So that point is critical. The low gravity of the moon is also necessary for low transport costs.

Phillips: Vacuum processing might have some influence on ore.

O'Neill: Well, you have your choice, you see. You can do your processing either in vacuum or in an oxygen atmosphere if you want to, because the soils that you have on the moon are 40% oxygen by weight. In the long run you can get everything from the asteroid belt.

Phillips: Just because people haven't become emotionally attached to asteroids yet, and because they have become emotionally attached to the Moon?

O'Neill: Well if you look at the economics, it's certainly going to be much better to build new colonies by going out with the construction equipment to the vicinity of an asteroid, taking the material right there, for which you don't have to pay anything in terms of a velocity interval to get it away, build the colony, and then move in the people, because their mass is very small, so the cost of bringing them is very small. And you've got the colony already working and productive and beginning to pay back

its construction costs, and then you can do whatever you like after that. Incidentally, the asteroid belt can very easily give the colonists Earth-normal sunlight. That's not a problem at that distance.

They have their choice. They can roughly over a period of one generation at a relatively low energy cost, work their way back into the vicinity of the Earth. Or, they could go the other way if they feel like it. You can imagine that during one generation, within 30 years or so, it would be technically quite possible for a big colony to move itself into even a polar orbit relative to the ecliptic. They could move themselves into an orbit so far removed from the rest of the human race that there'd be no interaction at all, except for communication of course, — if they chose to communicate. There might just be some totally absorbing colonies that would be listening to what was going on from the outside but not saying anything at all.

> Phillips: What are the things that you want worked on right now? If you were to pick the 10 subjects.

O'Neill: That's an awful good question, Mike. I would love to see some really good work on chemical processing of the ore coming out from the moon. How to get the good quality glass, good quality metals, and any non-organic fibers you want, anything of that kind.

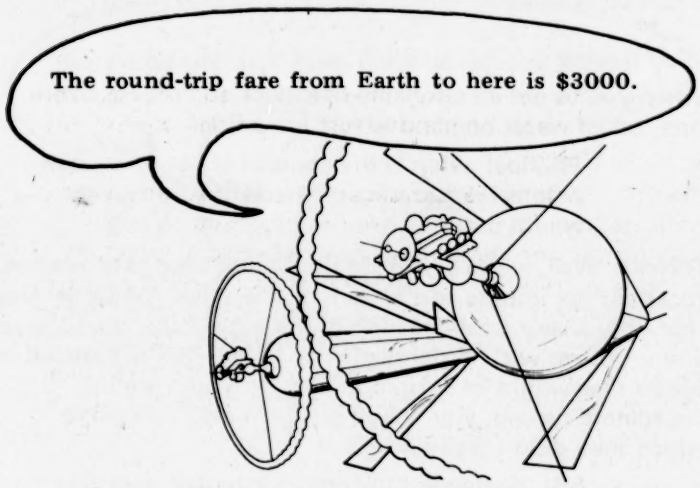
> Phillips: OK that's one. If there were 10 people you could set to work in teams . . .

O'Neill: Yes. I'd like to see some really good work on small-scale, closed-cycle agriculture. Some of that sort of stuff is already going on in some places. The question is to vary some things like oxygen concentrations, CO_2 concentrations, and so on. There are ways in which you could model this environment more thoroughly than it has been done up to now.

I think that somebody should be doing something which is really hard — it hasn't been done before and yet it's very accessible — and that is to analyze a number of the existing industries on the surface of the Earth in terms of their productivity, but measured in ways that we've not measured them before. Productivity in the sense of what is the total mass of the products that the industry turns out in the course of a year, divided by the total mass of the installed construction equipment of the factory itself. You can see why this is extremely important for us. It's never mattered to anybody before.

There's the question also of taking an industry, and saying what is the productivity of that industry measured in terms of the output products per person in the industry. But now possibly dividing the people into two classes, in a way that hasn't been done before. In an electronic age there need not be a distance of 50 feet between a design loft where someone is designing the next generation of products and the construction area where people are building this generation. There is no reason why, in this day and age, those things couldn't be a quarter of a million miles apart. And therefore you want to analyze an industry, seeing not just what is the total productivity in tons per man-year, but in tons per man of a kind that has to be associated with the production machinery, as opposed to all of the people who are selling, designing, administrating, and so on. You can imagine an industry which has one foot in each camp. You can imagine it with many of those activities carried on on the surface of the Earth, and a very good wide-band computer link-up between that area and the space community, and the actual construction going on in the space community.

> SB: Let's see, as you get into lunar distances, you're getting what kind of lag in communication?



O'Neill: Enough to be annoying for voice. It's like a second or two. In fact it's more than that. For a round trip time it would be almost 3 seconds.

> Phillips: You got a lot of things you could get started right now. In fact, by simply listing and describing them, you can get people to do them.
>
> SB: That's the kind of list I would be particularly interested in, because presumably some of our readers will go "Aha, that's me," and take off on it.

O'Neill: That would be very good. We need to have a more thorough and careful job done of looking at albedos and questions of thermal radiation from a space community, making sure there's no problem about holding the temperatures about right. We've been assured by the people down at JPL, who've sent all the spacecraft out, close to the sun and all the rest, that our particular problem is well within the range that they know how to handle. But it would be nice to look at that more thoroughly.

Let's see what other basic ones we've got. There's another class of problems which may take a while to get answered. It's the sort of thing that NASA would logically do, but I don't think they're prepared to go in this direction yet. The curious fact is that if you start designing one of these large communities, in terms of just the economics of how much in the way of materials you have to put in per person, it costs you very little to make earth-normal gravity. It turns out to be very easy. But to make earth-normal atmospheric pressure, costs you very badly, for two reasons. One is that 80% of our atmosphere is nitrogen, which we don't use at all. People can breathe pure oxygen atmospheres perfectly well. The Apollo astronauts were breathing pure oxygen atmospheres for days at a time. I've done it for hours at a time.

> SB: What about plants? Are they happy with that?

O'Neill: They couldn't care less. They take their nitrogen from the roots; they don't take it from the air. The main reason for going to anything but a pure oxygen atmosphere is just fire protection, apparently. And the situation that NASA has never had any reason to investigate, is one in which you have a pure oxygen atmosphere but have only 2 or 3 pounds per square inch pressure. That's about the same as the partial pressure of oxygen on the Earth, within our range of altitudes. In large volumes, as opposed to the confined volumes of the existing spacecraft, and with an abundant water source present. Now if you'll look at fire protection problems in that particular environment, I'm reasonably confident that you're going to find that fire protection is not that difficult, but that situation has not existed up to the present time, and no research has been done on it. All it would take really is a large vacuum tank, — where you can get rid of the nitrogen and have 3 psi of oxygen. To try to light some matches and see what happens

when you've got a reasonable size space and that pressure and lots of water on hand to put out a fire.

> Phillips: What is the coriolus effect on a small colony? What are the interesting things that would occur?

O'Neill: Well, we've been told that somewhere between two rotations per minute and three rpm, the range for Model One, that only a very small fraction of the population would have any problems with initial seasickness. Pop-flies in baseball on Model One would be curious affairs. In your rotating coordinate system, you would see them assume a curve which they didn't really have.

> SB: Someone I talked to yesterday, said you wouldn't feel it walking around along a cylindrical axis, or along a cylindrical circumference, but if you changed elevation, you would feel it. If you jump.

O'Neill: I don't know if that's true. Maybe. Not at the lower rotation rates. Apparently the people who have been put in centrifuges on the earth have been able to acclimatize to spin rates as high as 10 per minute. Going around once every 6 seconds. But that's something which you're going to get with practice say over a 10-day period.

> SB: If "in wildness is the preservation of the world," then in what is the preservation of the space colony?

O'Neill: Making it wild, I think. The long-term plan, really dream, that I would have is a situation in which, in 50, 100, 150 years, it would be so cheap to replicate large communities that you would be building quite large ones, many, many square miles in land area for each one, and they would be very thinly populated. And so the natural development it seems to me, is toward a situation where you have a great many wild species involved, and as wild an environment as you choose to make. I would imagine one on which there is a lot of forest and park area and wild areas, and a relatively small amount which is manicured and put into the form that people like to have for their dwellings.

> SB: Now you're restating your question, whether a planet's surface is the best place for a wilderness?

O'Neill: Maybe so. But this situation that I was just describing, this possibility if pursued, is one that could occur both on the Earth and in the communities of course. Because the existence of the space communities as a place to which many people might choose to move would also be perhaps the only realistic non-violent way in which the Earth's population might really decrease.

> SB: I'm trying to imagine the trapped feeling that one might have. Travel between communities would be relatively easy. Travel to the Earth's surface and back would be relatively hard. Is that correct?

O'Neill: It would be interesting to compare it in terms of real income. Passage between the colonies and the Earth probably corresponds to passenger travel back and forth between Europe and the United States in, say, the 1700's. It's the kind of thing that Benjamin Franklin did to go and negotiate treaties in France. It was not the sort of thing that the ordinary guy was able to accomplish.

The cost of going back and forth to the Earth — I made some rough estimates on what that might be with the technology of let's say 20 - 30 years from now, still nothing far out like nuclear power or anything like that — and came out to about $3,000 per person for a round trip. Among the colonies it should be very easy, very cheap. From one community to another, even 5,000 miles away would probably be as little as $100 or something like that. A few dollars in energy costs is enough to launch a vehicle over that kind of distance.

> SB: Another question on the life of the idea. Who are your predecessors?

O'Neill: I think the one that is really the most relevant is Konstantin Tsiolkowsky — the Russian who did the early work on liquid rockets. I had been looking for his works, and I had made various attempts in libraries without ever connecting with the right ones. Finally just this spring, a friend gave me a couple of Tsiolkowsky's books. I'm still trying to get copies of my own and haven't been able to yet. But the book which is most relevent is called **Beyond the Planet Earth**. It was written more than 50 years ago, almost 75 years ago. It's a novel, and so of course he was able to duck lots of issues, but he had the essential ideas, I think, very much better than most people who came after him. In particular, he imagined his first voyagers out from earth, soon after liftoff got out of the eclipse area and started building greenhouses. That was the whole point. They had been out there for weeks when it occurred to one of them to say, "Maybe it would be nice to go over and have a look at the moon." So as an afterthought, an aside, they went over and visited the moon. In the course of the visit they found gold and diamonds, easy enough in a novel, and then they did the next sensible, logical thing, they went out and started exploring the asteroids as material sources. There were some people much, much later, like at least 25, more like 50 years later, that talked a little bit in those terms, but not even they, I think, saw the whole as clearly as Tsiolkowsky. ■

Life in Space

A radio is very happy in Space — it's clean there. An Eiffel Tower would be happy in Space — no stress. A mouse or an asparagus in Space is miserable — freeze-dried to crystal. Man is the only life-form we know of that's made it in Space.

In other words the knottiest design problems in the Space Colonies are biological. And there are almost no biologists involved in the project so far.

This month the NASA Ames "Summer Study" group did very well in addressing two major problem areas — seasickness from rapid rotation of the 10,000-population Model 1, and the searing genetic effects of cosmic rays. To solve the first they settled on a 1 mile diameter wheel rotating once a minute. For the cosmic rays they kludged on a 10 million-pound shield of rock left over from mining. Not too satisfactory, that.

I asked Lynn "Gaia Hypothesis" Margulis what she thought of using low-nitrogen atmosphere. She predicted that any major deviation from Earth-standard atmosphere, which is made by life for life after all, would be nothing but disruptive.

So far there has been no contact between O'Neill's group and the New Alchemists, who have the only functioning completely-isolated high-protein production system. Philip Morrison suggests that research on the biology for the Space Colonies should be done in model colonies in Antarctica.

A good example of how easy things look apart from the biology is the paper on the facing page. It was done by Eric Drexler, 20, a junior at MIT, for the 1975 Princeton Conference "The Space Manufacturing Facility Concept." The twenty-some papers from that conference will be published in due (slow) course by Princeton University Press.

The problems cited above are a measure of how far design has already gotten. Design will proceed. Proliferation of interest is what's needed now, public knowledge and acceptance. From that the money. And from that the manufacture. And from THAT . . .

—SB

Deep Space Material Sources

BY **ERIC DREXLER**

I would like to outline three opportunities for the use of deep space materials, based on the materials available in the asteroid belt.

In going to this subject we are leaving the immediate terrestrial environment and also possibly leaving the ten to fifteen year time-scale. The asteroids lie mostly in a broad belt between Mars and Jupiter. There are several thousands of them and they range in size from 1,000 kilometers to fine dust and have various compositions. In the remarks that follow, I will discuss the asteroids that lie in the main belt, but it should be kept in mind that there are asteroids in the earth's space that are considerably more accessible, but they must be dealt with as individual cases.

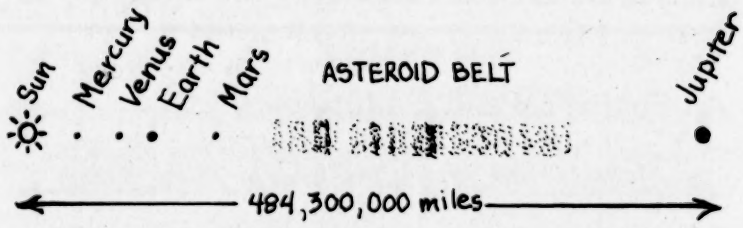
Recent observations from space-borne cameras indicate the presence of clouds of materials that are probably of asteroidal composition at the L4 and L5 Trojan points, which may possibly be present in amounts significant to the initial supply of colonies there. How much is there? This depends on the particle size, since all we have is the amount of light reflected and upon its composition, also on how you can catch it.

1) The first opportunity that I see is also the one that is the farthest away in space and time, and that is for the local support of colonies. Based on studies that I have done over the last year and a half, it appears that the asteroids have available the energy, metals, and organic materials necessary to support colonies in comfort and to provide for their expansion for many centuries. In virtually all respects, I would consider the asteroids to be a resource base equivalent in quantity to the resources found on earth. Because of this I feel that the asteroids are important to the long-range future of space colonization.

2) The second opportunity gets back to the question of hydrogen and organic material supply. I do not feel that the moon is as good a source of hydrogen as it appears to be. The asteroids do represent what I feel is a very practical supply of hydrogen because carbonaceous chondrite material is widely distributed throughout the belt. It contains approximately 10% water which is extractable at temperatures of about 200 degrees C. and about ½ the organic content of terrestrial oil shale. Because of the ease of processing this material, I feel that the supply for a fair sized colony at L5 could probably be accomplished by a very small station in the asteroids. Assuming that one is permitted to use atmospheric braking of payloads returning from the asteroid belt on arrival at the earth, one can deliver the material from the inner edge of the belt for a velocity increment difference of about 3.9 kilometers per second, and if one uses a liquid-hydrogen, liquid-oxygen rocket, known technology, low thrust, one only needs a mass ratio of about four and the fuel could be obtained in the asteroid belt from the 10% water that you have by electrolysis.

The time when this becomes a practical operation will be determined partly by the technology available and partly by the demand at L5. The problem is that you have an indivisibility in that the work crew that is being sent to the asteroids would be approximately a year's travel time from earth and therefore would have to be relatively self sufficient. Because of this you need a certain minimum demand before it becomes practical.

3) In the third opportunity we move considerably farther away from the present area of discussion. The barriers to any of these things are political acceptance and financial arrangements. This idea was suggested to me by Dr. Michael Gaffee of M.I.T. One can quite possibly turn a profit in supplying the surface of the earth with steel from



the asteroid belt. The asteroids contain steel in chunks ranging from 100 kilometers in diameter down to dust. It is, in its native form, a strong, tough, ductile and corrosion resistant material, and, for engineering purposes, it is superior to most of the steel produced on the earth, because it contains about 5% nickel.

A proposal has been made to use nuclear pulse propulsion to transport about a cubic kilometer of this steel either to orbit or to an orbit in resonance with the earth, to process it in space, (which provides excellent support for space manufacturing facilities,) and then deliver it to the surface of the earth. The reason for expecting a profit is as follows: transportation costs are estimated to be less than 5% of the value of the steel that is returned. The processing in orbit is relatively simple. It would be accomplished by melting chunks of steel in solar furnaces, then centrifuging the molten steel to draw off about 10% impurities, mostly silicate and sulfide slags, then casting it into forms which can be assembled into re-entry bodies for delivery to the earth.

The present value of steel on the world market is approximately $100 per ton. The world demand is presently about 70 billion dollars per year. At these rates, a cubic kilometer represents a supply for ten years and is worth 700 billion dollars. If we take account of the construction times involved for producing processing facilities at L5 and the maneuvering times imposed by celestial mechanics for sending probes out to the asteroid belt for prospecting, for sending out a work crew equipped with about one thousand 100 megaton hydrogen bombs, one comes up with a rough schedule which parallels the other space manufacturing facility activities. If one made similar assumptions to those of the energy supply proposition, one comes up with the time for initial deliveries of about 1989 to the year 2000. The capital costs are approximately 20 billion dollars for the transportation phase . . . this is sensitive to some things which are unknown regarding the interaction of hydrogen bombs with a mass of steel a kilometer in diameter and also of the actual mass of the hydrogen bombs, because their transportation is a sizeable fraction of this cost. You also have a capital investment which I would estimate at 30 billion dollars in processing equipment at L5. This could be constructed on site by boot-strap methods from lunar materials and consists mostly of mirror surface area and solar furnace cavities plus some centrifuges.

If this proposal is to go it will need public and international acceptance of the detonation of hydrogen bombs in deep space. This is, from physical grounds, an entirely safe thing to do because with the solar wind and the plasma environment of the solar system, one expects to receive, essentially, no materials of a radioactive nature or any other nature from the debris. Our hope is that if this proposal is technically feasible, and much work remains to be done on the subject, that its economic benefits will overcome the financial and political barriers that stand in its way. Whatever the outcome in this area, however, I believe the asteroids remain a valuable deep space resource. ■

Understanding Whole Systems

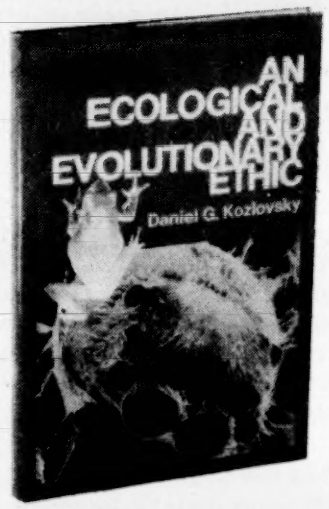
An Ecological and Evolutionary Ethic

The subject is right. The essays are bite-size one-pagers full of anecdote and pith. The author must be young, though well field-experienced in ecology, and a classroom veteran, and, ye gods, a hippie scientist. I'm so happy with his book I want to argue with him about details.

Ethics used to be the point of philosophy and education. This unusual book can help restore that sensible practice.

— SB
[Suggested by Tom Pockat]

An Ecological and Evolutionary Ethic
Daniel G. Kozlovsky
1974; 116pp.
$3.95 postpaid
from:
Prentice-Hall, Inc.
Box 500
Englewood Cliffs, NJ 07632
or Whole Earth



To an evolutionary biologist, how an organism came to be, and why it came to be, *mean the same thing.*

•

Evolution has no purpose. *Nor do we.*

•

I remember the countless thousands of times, as a kid, when I went into the bathroom to pee and found one of my father's cigarette butts in the toilet. I used to chase them around the bowl with my stream of urine. But I remember now, particularly, the dark yellow stain trailing down the edge of the bowl from the floating butt. Nicotine and tars. A marijuana roach in the toilet does the same thing. They are both chock full of stuff to get you off.

So the Surgeon General's report demonstrates conclusively to any individual who can understand the methods and conclusions of scientific inquiry that smoking tobacco will kill you. And why don't people quit? Is it because they have an attitude that "it ain't gonna happen to me," or, being good Christians and expecting eternal life elsewhere, they don't give a damn? *Or is it that they have to have a high?*

The old man's dead now, of lots of things, but the tobacco contributed its share to the destruction.

Twenty highs to the pack. "Plus Tax."

•

Nothing is as ridiculous, as pathetic, as obscene as an organism out of context.

•

There is no insurance so cheap and as easily drawn upon as human insurance, as the respect and concern and affection of your fellow man.

Each time you buy an insurance policy you add to the deterioration of the social organism.

A cock crows under my bedroom window, a wild jungle call. We never bred it out, probably because it doesn't affect laying capacity or meatiness. That crowing seems as wild and free and primitive as that of the northern Indian jungle fowl from which our domestic chickens are derived. Jungle under my window! . . . .

For a thousand generations men woke to a crowing cock, had interjected into their subconscious lives that small part of jungle wildness. In a couple of generations we have excluded these cocks from town and barnyard, and even the farmer now wakes to an alarm clock. The human world is the poorer for it, but does not know that, *cannot* know that.

Can you regain what you do not know you should have?

•

A scientific animism would consider the phylogenetic possibilities of animal empathy (you can *stroke* a mammal), not ignoring a lady I know whose pet Great Horned Owl understands her moods, is happy when she is happy, is down when she is down, and who (I use *who* instead of *which*; you would too if you knew the owl) tries to cheer her up by getting into some ridiculous mischief when she's unhappy.

A scientific animism would consider the multitudinous ways in which animals train *you.*

•

Sometimes I think that my boy puss, Rat Face, is really just a device cleverly designed to change cat food into cat dung. I know, of course, that this is wrong, although there is no question about his abilities in this respect. The biologist that I am recognizes that the boy puss is really something else, considerably less efficient, and that is a living device for changing cat food into cat!

A living organism is a system that continually draws materials and energy from its environment into itself. This material and the energy locked in its chemical bonds is rearranged, restructured, and ultimately incorporated into the living protoplasm. Eventually it is released from this organization, either excreted bit by bit, or freed by decomposers after the organism's death. In an absolutely fundamental way, therefore, an organism is a system for taking selected parts of the environment and organizing them into its own being, a system for rearranging them into its own essence, *into its own image of how the world ought to be.*

There are some important lessons here. It becomes obvious that the atoms of this planet are not randomly distributed in its rocks, water, and air; rather these ancient and primeval associations are covered by a thin film of living organization. Organisms are "nodes," or lumps, or hot spots of organization in the undifferentiated sea of environment, fantastically arranged collections of earth elements, some of them associations of such complexity and intensity that they can run or fly or sing or purr or think!

It also becomes clear that the organism-environment dichotomy is nonsense; all living things are open systems, constantly exchanging atoms with other systems, living and nonliving — there are no impermeable boundaries. Don't be misled by that thick skin of yours; when you cease to exchange, eat, excrete, breathe, you're dead.

The organism-environment comparison is fundamentally meaningless. The atoms are transients; what is environment today is organism tomorrow, what is organism tomorrow is environment the next.

We should be careful of what we dump into the environment, because, physically and psychologically, tomorrow it's likely to be us.

•

I see that the elementary laws never apologize . . .

— *Walt Whitman*

Where are the Earth's erogenous zones?

I'm not telling.

—Sam Love
Washington, D.C.

•

I saw an erogenous once in Colorado.

—Bob Atkins
Bryan, Texas

•

Obviously, the wet places are the erogenous zones. Creeks. Rivers. Lakes. Rivers. Oceans. Even puddles.

—Barbara Dorr Mullen
Santa Rosa, California

•

Why, its the:
TOPSOIL, fragile, alive, responding to our touch, our loving cultivation. It gives back beauty, fragrance, and nourishment.

—Doris Cellarius
Olympia, Washington

•

Dear Vital,

The Earth's principal erogenous zones are Corvallis, Oregon; Portland, Oregon; China Beach, Vancouver Island, B.C.; and wherever you are. Seattle will be on the list after a few months.

B'ar hugs & grins,

—Michael Finley
Portland, Oregon

•

[The quest goes on. Address your answer to: Vital Question, Box 428, Sausalito, CA 94965.]

Of Schweickart, Hardin, Gaia and Brother David

You did it again with the piquant juxtaposition: Hardin and Good Soldier Schweickart. *[Astronaut Russell Schweikart, "Who's Earth," and Garrett Hardin, "Living on a Lifeboat," Summer '75* CQ.*]* By their metaphors ye shall know them. H's lifeboat is a righteous image springing from an already-existing viewpoint. It has consequences — thus and therefore thus and thus. It is stern, serious, and oughtful. Astronaut S., on the other hand, becomes astronought Everyman and simply sees. What he says has meaning but no necessary consequences. He (the military man) says nothing about a captain; seeing is apolitical. And there's no substratum of fear. The lifeboat passenger, like the rich man, has committed himself to fear. He's got something to lose, and he's haunted by those safety factors and those hedged bets that never seem quite sure enough. One hell of a frame of mind.

What we have here in these two articles is a lovely contrast between a scheme and a realization, a grabbing and a relaxing — between control and letting go.

But, whether you favor H's view or S's, it doesn't pay to be righteous. R. H. Blyth tells about the Zen monk who says to his Master, "If a snake is swallowing a frog, should you save the frog or not?" The Master replies, "If you save the frog, you're forgetting the snake's point of view. If you don't save it, you're not behaving like a human being." It's the old double bind. You can't win. And the Master is trying to get across that you shouldn't expect to. The universe isn't run on the point system. And survival isn't what it's all about. Do what you're going to do; and with humor be aware that you might as well be doing the opposite.

The Gaia hypothesis. Nice. More interpenetration of intuition and science. (As if they hadn't been frigging away right along.) Convergence. "This is our body — eat!" and the biologists diving in. We shall all be in Rome yet someday.

Please, someone like Brother David in every issue. Here, beautiful, authentic.

—R.K. Welsh
Scottsdale, Arizona

Growth and Its Implications for the Future

Cheap at twice the price. Big bargains from the GPO. First you get the not-yet-nostalgic kick of realizing that the subcommittee was carrying on these brief hearings while guess-who was still president. And you get to read the awkward interchange between the congresspersons and the panelists. But that only takes a few pages out of the thousands here. For the rest, some closet anthologist on the subcommittee's staff has thoughtfully assembled and excerpted or reprinted entirely a good many of the current classics of the growth debate, viz, **Limits to Growth, Only One Earth, Resources and Man, Population Growth and America's Future**, *The Ford Foundation Energy Policy project, and innumerable more. They have also included a bunch of responses to the aforementioned works, so the overall effect is like a good symposium. Mind you, you'd have to be magna cum laude from Evelyn Wood to get through these things in less than a year (I didn't yet), but these homely looking volumes are the sort of stuff it would be handy to have around for the next few raging arguments. Their only weakness is that they don't venture out of the centrist camp, but then it never hurts to keep up with what the establishment is thinking.*

—*Stephanie Mills*

•

Our pursuit of the infinite must take place in the realm of the infinite which is spiritual, not material.

Growth and Its Implications for the Future
(Hearing with Appendix before the Subcommittee on Fisheries and Wildlife Conservation and the Environment of the Committee on Merchant Marine and Fisheries House of Representatives Ninety-third Congress)

1973; Part 1, 996pp.
Part 2, 996-1700pp.,
Part 3, 1701-2494pp.

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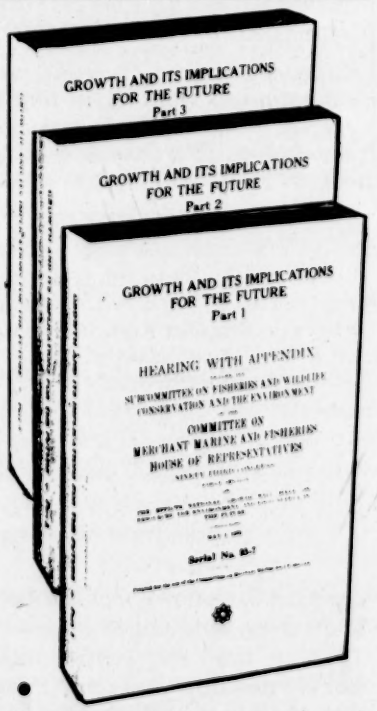

GROWTH AND ITS IMPLICATIONS FOR THE FUTURE
Part 3
GROWTH AND ITS IMPLICATIONS FOR THE FUTURE
Part 2
GROWTH AND ITS IMPLICATIONS FOR THE FUTURE
Part 1
HEARING WITH APPENDIX
COMMITTEE ON MERCHANT MARINE AND FISHERIES HOUSE OF REPRESENTATIVES

•

Distribution is a moral problem, as is population control, and we lack the moral resources to solve these problems because our limited energies have been overwhelmingly devoted to material growth, while morality has been relegated to the status of pre-scientific superstition. —*Herman Daly*

Caring and Clarity

CONVERSATION WITH
GREGORY BATESON AND EDMUND G. BROWN, JR. GOVERNOR OF CALIFORNIA

What I wanted to try was a mutual context interview. Interview the philosophical Jerry Brown in context of Professor Bateson. Interview the apolitical Gregory Bateson in the office of Governor Brown. Each had heard favorably of the other and so convened in Sacramento on June 24th, 1975.

At 37 Jerry Brown is the second youngest governor in America of the most populous state in America. (It became most populous during the administration of his father Pat Brown.) With an $11 billion annual budget California is rated by some to be the seventh largest government in the world. Brown has won enormous public support for his efforts to limit that government. In a recent poll 85% thought he was doing a good job — the highest marks ever given a California Governor.

To me Jerry Brown is the most interesting man in politics right now. He fulfills Gregory Bateson's statement of the need for "government by ideas as distinct from ideals." Brown has ideas about how to search out the "political truth" in an issue, and he makes them work. To many observers this process looks off-the-wall, unfocussed, enigmatic, but they've had a tough time challenging the results. Brown questions well and learns fast. He appoints unusual talents and demands as heroic work from them as he himself delivers fourteen hours a day six days a week. So far Brown has kept his zest, and the Governor's office has never performed so competently. Or strangely.

Gregory Bateson, 71, is also widely considered an enigma. Something is working for him but people aren't sure why. He has earned separate and considerable reputations in psychology (the Double Bind theory), anthropology, linguistics, cybernetics, philosophy, and the arts. His book **Steps to an Ecology of Mind** *led off our WHOLE EARTH EPILOG and continues to inform most of what we do in* **The CQ**.

Gregory and I reported to the Governor's office at the appointed 6 pm, learned that the Governor was tied up in a school budget meeting (Brown tends to let meetings go on as long as something is happening rather than as long as they're scheduled), so we went to dinner with one Jacques Barzaghi. Jacques, who is French, is a special advisor on the arts in the Governor's Office. Gregory said of him later, in describing the visit, "This man is VERY bright."

As it turned out we didn't get to Brown until 11:30 pm. Gregory and Jacques hit it off so well I turned on the tape recorder while we were waiting. The two continued an intense conversation begun at dinner, during which Gregory said that education finally came to a complete standstill in the '60s. "The children decided they didn't like it." The mode of this conversation was: Jacques would ask a short fierce question. Gregory would breathe for a few minutes and then tell a story. Jacques would stare at the carpet for a long time, and then ask a short fierce question. I would try to curtail my nervous interruptions of those damned silences.

As usual with our interviews, the participants have checked and corrected the edited transcript. The editing was to condense the rambling late-night conversation to one-third its original length without changing the actual interactive feel of the occasion. A tape is a kind of a photograph, not to be too prettily retouched.

—SB

Jacques Barzaghi: It's like there is no alternative.

Stewart Brand: To what Gregory is saying?

Jacques: If I have the understanding of what you're saying, there is no alternative, there is no fooling around. I mean it's like Suzuki Roshi would say, "There is no goofing off any more."

SB: What's Blake's remark on that? About understanding and believing?

Gregory Bateson: *"The truth cannot be said so as to be understood, and not be believed."* . . . . It's only 1975, and in 1975 we don't know all the things we might know in 1990. But we do know that some things are wrong. This is another little matter, by the way, that is not generally understood or taught by the schools, namely that science never claims to be ultimately right, but does claim that some things are wrong. I mean it makes hypotheses and they may be pretty tough and strong, but in the end they can be kicked in the pants, and probably will be. It is possible to kick ideas in the pants and out they go. Less so than it used to be. The tendency now, of course, is to have them "reframed." The lot that you knew now stands on new foundations. Knowledge remains the same. But obviously it's going to change an awful lot.

SB: The basic structure?

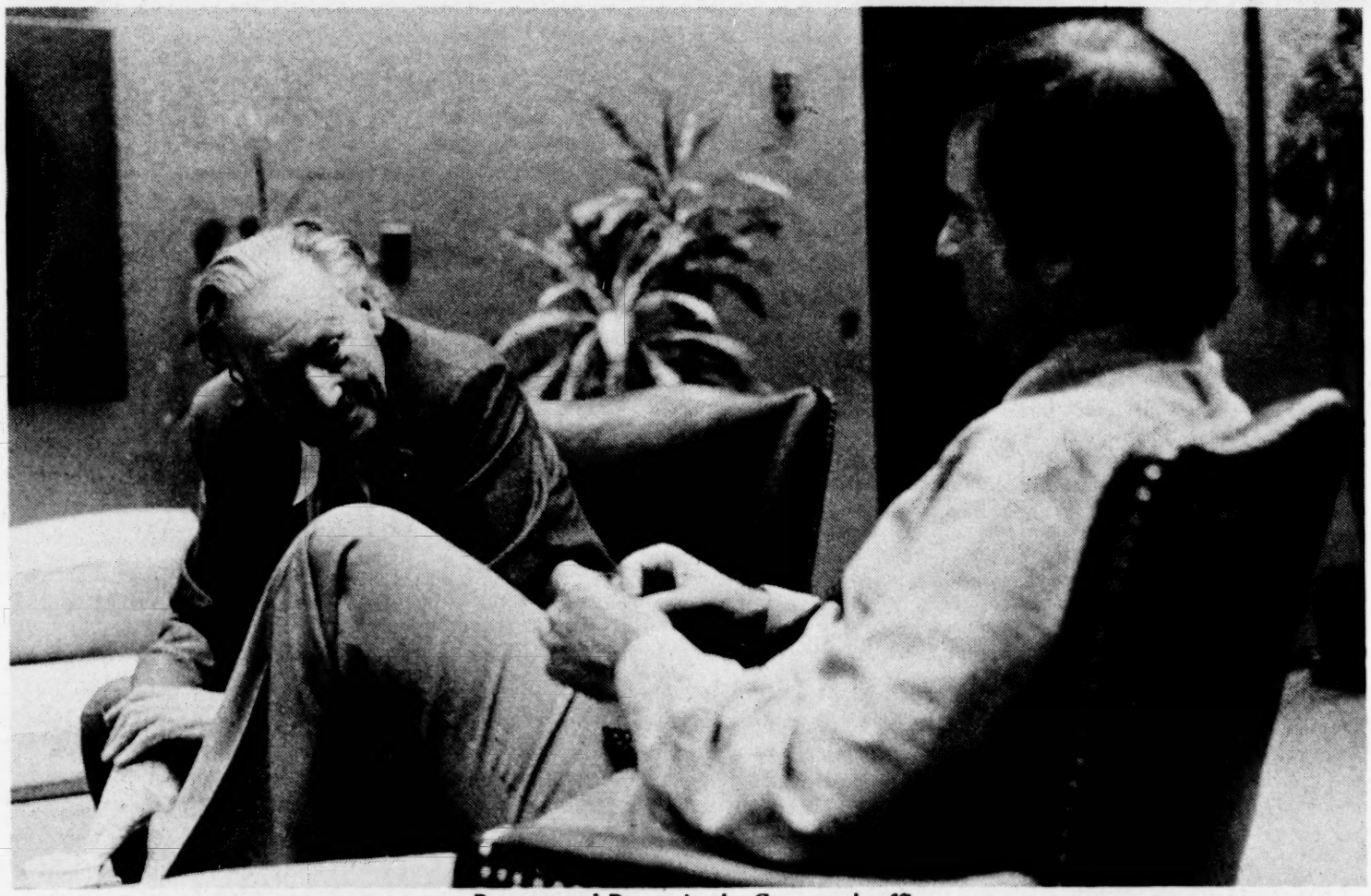
Bateson: The basic structure. With the discovery of circular causal systems — that's the base of ecology in the end.

SB: By that you mean the opposite of input/output.

Bateson: The opposite of input/output, yeah. There isn't a line here, an idea behind it, and I have an input which comes from you and an output which goes from me to you, and that's where I sit. Because there is a connection through you.

SB: That's circular causality? And that's what you've been saying by "circuit"?

Bateson: That's what you're saying all the time. That's what



Jacques Barzaghi

Bateson and Brown in the Governor's office.

your magazine is certainly saying.

SB: But we forget. And I would like a way to where forgetting was structurally impossible. And if that's religion, fine. But something that basic.

Bateson: It's that basic. It's the sort of thing that Roy Rappaport is after of course. How do you peg . . . ? You have to make a change, and then make another change which would have to be undone before the first one can be.

SB: I don't know what you mean.

Bateson: You are, we will say, a hypnotic subject. You come to me to be cured of smoking. I can give you suggestions which will suggest that you shouldn't smoke, and you may stop smoking for a week. But then the thing will leak, and it will leak because the suggestions were not backed up by a context which pegs the suggestions in place.

SB: The false premises are intact behind the correct knowledge.

Bateson: That's right.

SB: Okay. So the second change works out. How do you get at the context?

Bateson: You should ask Milton Erickson this question . . . . Milton was working with an alcoholic. The guy was an ace in World War I and he comes in with an album of photographs of himself, newspaper clippings, and he's a lush. He wants to be cured of being a lush. He shows this book to Milton. Milton picks it up and throws it in the wastepaper basket. "It's nothing to do with you, that." Then after various exchanges, Milton asks him how he always starts on a binge. "Well, I set up two boiler-makers, and I drink one and I wash it down with a beer, and I drink the other and I wash it down with a beer, and then I'm off." "Okay," says Milton, "you will leave this office, you will proceed to the nearest bar, you will order two boiler-makers, you will finish off one and as you do so you will say, 'Here's to that bastard Milton Erickson, may he choke on his own spit.' When you pick up the other one you will say, 'Here's to that bastard Milton Erickson, may he rot in hell.' Good night." Now what's he going to do?

SB: He's been colonized.

Bateson: He has been colonized. That's correct. His drinking has been reframed to be within the frame of the bastard who took his album and threw it in the wastepaper basket. The man came back a year later, sober.

The world is backwards.

This of course is very difficult for Governors.

SB: For whom the world must be forwards?

Bateson: For whom it is exceedingly difficult to take a gangster, or a criminal, or what have you, and say "I don't think you're a very good criminal, can't you do better than that?"

Jacques: Another question came in my mind. What is the direction?

Bateson: Two components. One: it is possible to care. The other: it is possible to be clear. My students in general do not believe it is possible to think, and they do not believe there is anything worth caring about. They believe both those statements to be false. Now, the Hitler *jugend* cared — the kids, you know. But I don't think they knew how to think, there wasn't any clarity. The material path, of course, in Germany was a steady rise — the autobahn, the freeway, and all these things. The rise from 1918 to 1934 — 16 years, that's perfectly fantastic. The caring will do that, but I don't think the caring without thinking will work a superb civilization. Without the clarity. Without believing that clarity is possible.

Jacques: Where is the school for clarity?

Bateson: Patches. There are patches at U.C. Santa Cruz. That's where I teach, at U.C. Santa Cruz . . . . There's a lot of hunger among the kids for clarity, and for being given

One of the real problems in life is how to get at one's gut response to something. One of the ways of getting at the gut response is by dialectic of some kind.

Bateson

permission to care. But they're liable to think that if my generation tells them that you're allowed to care, that I'm seducing them in some way. And of course they're the ones that when I make them have some clarity, they say it's a head trip. You see, there ain't such a thing as a head trip. It is a head trip if you start with the belief that the mind is separate from the body. This, I suspect, is a nonsense. But they are hungry.

SB: Yes.

Bateson: What sort of responses do you get to Roy Rappaport's essays on the sacred in CoEvolution magazine?

SB: Can't tell much. They're quiet, whoever the readers are.

Bateson: They don't hit back?

SB: I get hits back, but usually not about that.

Bateson: *[To Jacques]* The first point Rappaport makes is that the purpose of the sacred is to establish trust. How do I know that anything that you say or that Stewart says is reliable and comes from the heart? Now, the first step is to make you put your hand on a Bible and swear — to invoke the sacred behind-statement. Well, the putting your hand on the Bible and swearing has been now used so much in courts of law where people lie, that it doesn't work so well. It's worn out. So what can you do next? You can go for a walk in the woods with a man and put your hair down and hope that he puts his hair down and that you're somehow a little closer to it. And maybe what he said there, because of the woods, or something, is sacred. On point of death, maybe, people will tell the truth. Death is sacred. We're awfully short of criteria, where you can be sure that somebody is playing straight. They say in New Guinea, "True on top, master." Loyalty oaths kill the teachers but they don't kill the Communists. . . .

Jacques: What do you mean by clarity?

Bateson: . . . I mean the right use of metaphor. We all use metaphor; we all use analogy. This is called explanation.

I believe that the world on the whole should make sense. That is, that the reasons that lie behind something are similar to the reasons that lie behind something else. I believe that the reasons why books are rectangular is similar to the reasons why a room is rectangular, for example. That is, you see patterns of one kind or another, and you see a reoccurrence of those patterns in other places.

You see that a plant which has asymmetrical leaves then has to be dorsal-ventral. A begonia branch has a leaf coming off here, a leaf coming off there, etc. — a zig-zag between the leaves. Alright, each leaf is asymmetrical, a begonia leaf is very skewed, actually. And these on this side are all skewed this way, and the ones on the other side are all skewed the other way — so that you've got a bilateral symmetry running up. In order to have the asymmetry on the side, you've got to have the bilateral symmetry down the middle. I call THAT clarity.

SB: What are examples of lack of clarity?

Bateson: Oh, any quarrel in which I believe it was my fault or I believe it was the other guy's fault. They're equally untrue analyses of the nature of the quarrel. Mm hm? The whole of war propaganda being based on that anti-clarity. A schizophrenic patient once — I was trying to make him think his mother was to blame — turned to me and said, "Germany's forgotten when we see the colors of everybody."

SB: I don't get that.

Bateson: You can't go blaming my mother. She didn't start my pathology any more than Germany started the war. People are like that. Everybody's like that. "When we see the colors of everybody." He used "color" in a special way. "The CONTRIVANCE," he said, "to change the color of a man's EYE!" — which is both e-y-e and the personal pronoun — "to please a psychologist is too much. And you are all psychologists. Though some of you turn and become medical doctors for that part of you which hurts — never thinking of the man so sick he has to munch on his own." Doctors and ward chiefs don't like patients who say things like that.

SB: I think all that stuff is increasingly relevant because the state and the country and the world is a madhouse — technically. A loony bin. And because it's unacknowledged, or only acknowledged popularly and without meaning, the pathologies may be clearer in the standard loony bin. This is why listen to very good crazies, and why listen to Gregory's experience in the VA Hospital and elsewhere. You were saying?

Bateson: What I was trying to say, and I don't know how to say it, is that here we are, three of us, reasonably successful people in a certain way. To get where we've gotten to we MUST have known all these things in our gut somehow.

We're on this double-edge between caring and clarity. Certainly either or both can be messed up, obfuscated. I mean, all right, my dog can care with an intensity that on the whole I can't manage. Caring is way down, at the mammalian level almost. A dog can have heartbreak and all the rest of it.

Now clarity, that's something different. Granted it can be obfuscated, messed up — the household in which the pronouns are twisted around all the time. "You must be feeling tired, aren't you?" What your mother meant was that she was feeling tired. Oh, god, the things that go on in schizophrenic families with pronouns.

SB: What do you think when an editor or a President Nixon says "we" all the time?

Bateson: That's all right. That's culturally stylized. But you know you can play tricks with that "we." It becomes a seductive device, of course.

SB: The attempt often is to outnumber the other party.

Bateson: To outnumber the other party, or to use the "we" inclusive.

Jacques: I have the feeling we are going somewhere or we are doing something, but I don't have the where-to. I know we are going somewhere.

Bateson: With this talk, you mean.

Jacques: No, no. Everyone. What is the direction? Do you allow the beer on the campus, or you don't allow the beer on campus? Should the Governor sign the bill saying, "From now on the students on campus are allowed to smoke marijuana and drink beer, and whatever." There's a conflict there. I'm not sure. Are we going downhill by allowing beer and marijuana on campus?

Bateson: Right. There's something wrong with the question in the first place. The question is set, "Is tolerance (or non-interference) on the part of authority — is this a way of making the other guy pull up his socks and go on his own, increasing his strength, or is it just letting him go to hell?"

Now I'm perfectly sure that there is no simple answer to that

question in that form. Therefore it's authority in such-and-such a setting versus authority in another setting. How do we define those settings?

Nora — my daughter of seven — always knows whether I really mean it or I really don't. She's more accurate than I am on that.

SB: You sometimes don't know if you really mean it?

Bateson: I sometimes realize when she doesn't pay attention that I really didn't mean it.

[The ruling that eventually went out said that each campus should make its own rules. Decentralization of authority is native to the thinking of both Bateson and Brown.]

Jacques: You use one word. You say "honest." How you define "honest"? How you recognize "honest"?

Bateson: At the very simplest sort of level, if my daughter Cathy says, "I feel sad," and you look at the corner of her eye you will see moisture. The movement of the body and the movement of the words go together, on the whole. I'm talking about "honesty ABOUT" something in there. She doesn't bother to conceal too much of what's going on in there. Oh, I guess in ordinary manners she'll conceal some.

Now this is the first thing that a schizophrenic asks. A schizophrenic says, "My father died yesterday." And the therapist says, "Gee, I'm sorry." And the schizophrenic looks at the corner of his eye to see if he is sorry. And if he isn't, fuck him. Therefore it is no use when you're dealing with an identified schizophrenic — a schizophrenic who has identified himself — it's no use trying to worry whether your slip is showing, whether your fly is undone. You can't conceal it. You have to assume that he knows what's going on. It's very good discipline.

SB: This is not true of your students?

Bateson: It's true of good students. True of a lot of students — much more than it ever was in the past, I think. On the whole, the movement of the rising generation has been toward a schizophrenic answer. Which also has this funny cruelty about it — that they don't care if you know how they feel . . . .

Jacques: Is honesty a quality?

Bateson: I don't think it's one you can cultivate much. I'll tell you what, you can't cultivate it today for today. You can only cultivate it today for tomorrow or the future.

SB: If you try to be honest now, the trying gets in the way?

Bateson: The trying gets in the way, and everything gets in a mess, but it's still worth doing for the sake of tomorrow.

SB: That seems to be one way to get at premise structure.

Bateson: That's right. That's what we mean by education, in the end.

SB: That's why you like rote learning?

Bateson: Not only that, but you can't tell what a tune is till you've played it a great many times. You can't tell what a poem's about until you pretty well know it by heart. Perhaps until you've recited it to somebody else.

Jacques: Is honesty a lack of sophistication?

Bateson: Primary lack of sophistication is honest. Acquisition of sophistication may in the first rounds at least make for a dishonesty. Then in the end you get back to an honesty again, I think.

"Expose the truth in the situation, and then people by recognizing it are moved by it." Isn't that what Gandhi talked about?

Brown

This is the human dilemma, really. Aldous Huxley used to be very clear about this. That the animals are honest through an inability to lie. God is honest, probably through an inability to lie. Man is somewhere in the middle, and he's got skewed off to the side some way. And grace, or something, is the attempt of the human being to get back onto that line again.

Jacques: How can compassion and honesty go together?

Bateson: It hadn't occurred to me they blocked each other. Pity is a little different. In pity, I'm getting an ego trip out of being-sorry-for. Compassion is not an ego trip as much.

SB: More an acknowledgment of connection that's really there, isn't it?

Jacques: I mean, honesty is expression of one's feeling. If I know my pain can create pain to you, if I feel compassion I can hide my pain and give you a big smile . . . .

Bateson: Oh, I see, that sort of compassion. You're on very slippery edges there.

My best source of material on schizophrenia was a schizophrenic in the 1830's, who wrote up his experience very accurately. This is now a book called **Percival's Narrative**. One of the things he said was, "I have often wondered why I wrote such angry letters to my mother and my sisters from the hospital. And partly I wrote these letters angrily because I knew that the doctors would read them, and if the doctors thought my anger was evidence of my insanity, they should have plenty of it. But also," he says, "there was an insane reason for writing in such anger. Namely, that I knew that to learn that one had abandoned somebody one loved would be a very great agony. And therefore I wrote in anger so that if they should realize how they had abandoned me in the hospital, they would be able to say to themselves, 'But he wrote us in anger, and he deserves what we did to him.' "

And my advice to anybody who wants to play that game is don't play it.

A good guru, you know, is enormously self-contained. And compassion as used by these Orientals, when they refer to Kwan-yin as the goddess of compassion, it's a sort of cosmic understanding. It's not a thing we have a word for properly, I think.

"He who would do good to another must do it in Minute Particulars."

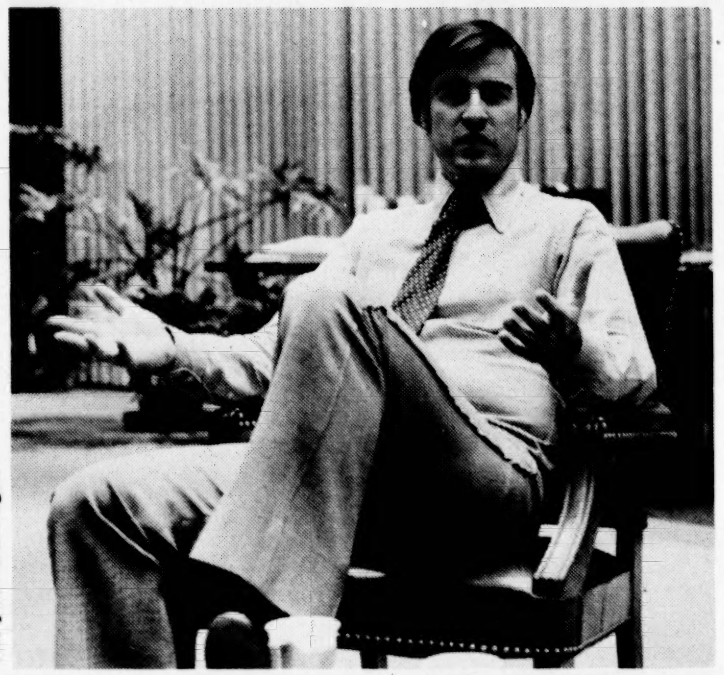
SB: That's worth putting up on one of these Capitol buildings.

Bateson: You know the other half of it? *"General Good is the plea of the scoundrel, hypocrite, and flatterer; for Art and Science cannot exist but in minutely organized Particulars."* It's a grim text. *"Thy Christ is a friend of all mankind. Mine speaks in parables to the blind."*

SB: Is that Blake?

Bateson: Yeah.

Jacques: I'm still not satisfied with honesty. I



Jacques Barzaghi

wonder on what level men lose or have the chance to lose honesty.

SB: Rappaport says language.

Bateson: Language is a very important piece of it. Voluntary control of autonomic circuits. To be able to blush on purpose. We went to the zoo a long time ago, I and a poet named Weldon Kees, to decide whether the animals in the zoo knew that their messages were messages. You can't deceive unless you know that you're giving out messages. Does a dog bark louder to answer a dog who is far away? No, he actually barks louder to a dog who is close. He does not correct for the distance. And so on.

And we ran into the fact that the animals play. Now "play" means that they've got to be able to distinguish this [*nips playfully*] from this [*bites ferociously*], and it may not be just a matter of how hard it's hit. It's a matter of a whole classification of what's happening. You can play hard, or you can fight hard, or you can play soft. . . . So it's a good thing to know whether you're playing or fighting. That day was the beginning of all this thinking that you've been having little bits of all evening.

I mean what is going on between you and me, between me and him, between him and you, between him and us, and so forth. What are the frames in which we are operating? Now there are various words for such frames. Play is a word for such a frame. Exploration is a word for such a frame. Combat is a word. Love is a word. Caricature is a word. There are a lot of words for such things. And you say what is honesty? It's partly a word for a frame of that kind; and it's partly a word for not faking a frame of that kind.

SB: Say more about what happened at the zoo. I'm not clear how that started all the rest of this.

Bateson: It started the idea that you can have classes of behavior. It's very difficult to teach a rat not to explore. They are exploring beasties. So you try and teach them not to explore by having a number of things in which they will put their noses, and if they put their noses into those boxes they get an electric shock. This does not teach them not to explore, because the purpose of exploration for them is to find out whether there is a shock in the box. The exploration has been a success. They got the information they wanted. The word "explore" is a classifying word more abstract than the word "put-nose-in-box". You can teach them not to put their noses in a given box – that's different.

The next thing we discovered was that a schizophrenic has a difficulty with words of that sort. "Is he playing, or not playing?" And this is where things hurt. This evening on the whole we have been exploring to see whether this is play, what sort of thing it is, what sort of level of exploration it is, where can you fit together, and where can you fit with him and me, where can I fit with you and him, around this table, and so on. This is where pain is. If as we leave tonight, you say, "That was an utter waste of an evening," you know, I'm going to hurt. Now, I'm not in love with you, you're not my mother, you're not my father, but any pulling of the rug from under one about the nature of context, the nature of "was it play, was it irony, was it direct, was it straight, was it funny, was it meant to be funny, was he laughing at me, was he . . ." that all hurts like hell. To be wrong about something in the newspaper doesn't hurt. To be wrong about a human context hurts like hell. Now this is where the schizophrenia comes in, and this you see is where the younger generation is fighting. They are saying, "You couldn't give us a straight statement about the context we were being born into."

SB: Because in fact they've not gotten such a statement?

Bateson: Yeah. World War, Versailles, one thing and another. . . Propaganda, which is a fake. However strongly you may feel that for which you are propagandizing, the propaganda is still fake. The prevalence of television, which is framed as advertisement, it's framed as manipulation. . . .

I think schizophrenia has to be spelled out a little bit. Schizophrenia is a habit of outward behavior – and perhaps inner thought. I don't know about the inner thought, but the outward behavior is fairly clear – in which a component of the message is either distorted or hidden. You know Western Union telegram forms. They have a place for how important is the message, priority, the place for the date, the slot for place of origin, time of day, to whom, from whom, and then the message itself. Well now, all that top stuff is the stuff that a schizophrenic plays with. He will pretend that the message has no importance when it's absolutely vital. He will pretend that it's not from him, it's from Napoleon. It's not to you, it's to Nelson. It isn't today, it's a thousand years hence or a thousand years back. It's not really about anything, it's science fiction. The framing of the message is partly falsified all the time. That's what they do. They do this for safety. Because not to do it, is to act as if they knew whether it's play between you and me, or respect, or exploration or what it is. They've been hurt in their identification of that. They are incredibly sensitive and able to identify those things. But they dare not put their knowledge on paper or in the talk, because they have been penalized for showing that they knew.

SB: And if they acknowledge to you that they do know, they're in it again. What's therapy for that after all?

Bateson: Caring, clarity, and no goddamn nonsense – an evident lack of nonsense on the bottom level.

SB: Nonsense being propaganda?

Bateson: Nonsense being pretending to care when you don't care. It's alright to not care. You can help them if you don't care and exhibit to them that you don't care. It's still better to care and exhibit the fact you do care. But don't get caught exhibiting the non-fact that you care. That's the end.

[At 11:30 we joined the Governor in his personal office, a spacious room now decorated with excellent Chicano art in place of the plaques and awards of the Reagan era. Brown's education budget discussion was just ending. He had kept one Bill Honig from the Board of Education, who was interested enough in Gregory Bateson to have read **Two Cybernetic Frontiers** *and* **Steps to An Ecology of Mind.***]*

Bill Honig: We've just been talking about education.

Governor Brown: They want more money.

Bateson: Well, they pay me too. Some of their money comes to me in the end . . . down in Santa Cruz.

Brown: That's probably good. You teach at Santa Cruz?

Bateson: Yes, some, part-time. But my impression is not favorable.

Brown: With respect to Santa Cruz?

Bateson: No, we get on the whole the cream of the crop there, I think — high-grade students. They've not been taught anything before they came though. They don't know the multiplication tables. They don't know the Lord's Prayer.

Brown: In Latin or in English?

Bateson: Certainly not in Latin, but they don't even know it in English. They don't know any Shakespeare or any Blake. They don't know what a segmented animal looks like. They don't know how the leaves are arranged on a plant. Hell, Stewart, what do they know?

Brown: That's a very interesting observation, because we've just been talking with members of the State Board of Education, and the finance department and representatives from legislature and we're considering millions more for schools. And you're telling me the students that come to Santa Cruz don't know very much.

Bateson: That's right.

Honig: And these are the best.

Brown: And these are the best, so what are we getting for our millions?

Bateson: God only knows.

SB: Somewhat less than nothing, I think.

Bateson: They know many things that are not true, no doubt.

Brown: Well, I don't know. He's also a teacher —

Honig: Elementary school. The thing that's bothered me most over the last five years . . .

Brown: He's a lawyer who gave it up to become a teacher, and I put him on the Board of Education. . .

Honig: . . . is if you look down through society, every other culture has models that children identify with, they get a very strong identification. Parents and community are not strong enough to say "This is what we believe in." The kids pick that up. They never get that emotional attachment to a set of ideals that allows them to formulate their own sense of identity.

Bateson: We haven't any heresy, even.

Brown: We have no orthodoxy. It's just sort of a general malaise.

SB: Yeah, and more money doesn't help that.

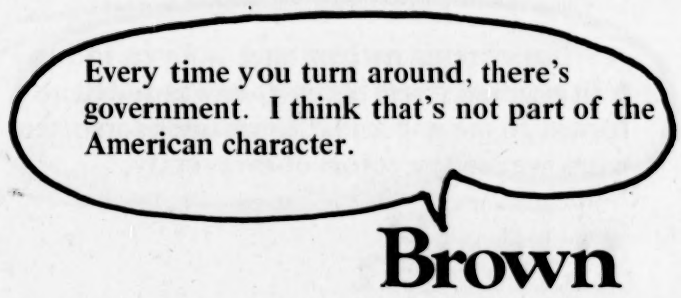
Brown: It probably encourages it, because it postpones the day of recognition of the emptiness.

SB: In a sense you're rewarding a process that's gone wrong at its core. If anything would need to be stressed, it's to start paying attention to the idea that there's such a thing as mistakes.

Bateson: "You can be WRONG."

Brown: How does that relate to the school system?

SB: The school system doesn't teach there's such a thing as mistakes at present, that you can be wrong, and not only that you can be wrong, you can think wrong. Your premises can be wrong.



Premises aren't brought up very much.

Honig: [*To Brown*] Remember going to law school, the case method? — the first time I was taught to think in that way, which is another way of thinking. I never even came across it till law school.

SB: Gregory was asking earlier, how come we stopped teaching religion in schools?

Bateson: Well, that's part of the Constitution.

Brown: What, the separation of church and state?

SB: Is it a good idea?

Brown: What? To teach it or not to teach it?

Bateson: Not to teach it.

Brown: But it's a pluralistic society and it's supposed to be . . .

Bateson: Well, then teach three of them.

Honig: You can teach religion. That's been a misapprehension. As long as you're not indoctrinating children, you can say here is what a certain religion believes, here is the set of beliefs, and you can talk about it, and you can do it with another religion, and another set of beliefs. There's nothing to stop that. They don't do it. They just shy away from it completely. You can't even find a Biblical story.

Bateson: But, if you tell them this is what the Jews say, and that's what the Christians say, and that's what the Buddhists say, you in the end pull the rug out from all of them.

Brown: So the real question is what do you say as the teacher, the transmitter of culture. What is it that one generation has learned that it's going to pass on to the next generation. And right now it's a Tower of Babel. It's just a lot of discussion. That's the ultimate logic of the individual. Each monad is expressing his own perception, which happens to conflict with many others — so children, where are they? They're confused. So what does that say about where America's going to be in 20 years?

Bateson: The kids are very hungry. There's no doubt about that.

Honig: For models or what?

Bateson: For something that'll make sense.

Brown: And you don't think they get that. Are you teaching at Santa Cruz? How do you think they relate to the university?

Bateson: The kids? To the university? "What's that?" The university is administration as far as they're concerned.

Brown: Well, you certainly get that feeling when you go to the Regents meeting and then you talk to students you may find on one of the campuses as you go out of the meeting. It's like walking from Mount Olympus down to the . . .

Bateson: Yeah, the kids ask, "Is he saying anything and does he mean what he says?" It's as gutsy and basic as that really. Then there's 30, or maybe 50%, who say "Is it an easy course, can we get grades?" I was saying to Jacques that there are really 10% who are worth teaching.

Honig: Has that changed? From 10 years ago, 20 years ago?

[more →]

A schizophrenic patient once – I was trying to make him think his mother was to blame – turned to me and said, "Germany's forgotten when we see the colors of everybody."

Bateson

Bateson: Oh yes. Look, it was much easier to teach 20 years ago. They assumed they were supposed to listen and regurgitate, and swallow it, and that.

Honig: So the perceptions are what is different.

Bateson: What brings them into the room is sort of different, yes. The questing is quite different.

Brown: The questing now is intensified? With the 10%?

Bateson: With more than 10%. There are an awful lot who are terribly muddled. You've been reading my stuff. I'm almost a positivist you know.

Brown: So that's why you like clear analysis. You think ordinary language provides a basis to put your –

Bateson: I don't think medieval language was much use.

Brown: Medieval language was very simple. It was the classical language, at least made so I could understand it. Medieval Latin was a little easier to follow than . . .

Bateson: Medieval LATIN maybe.

Brown: Classical Latin. That was the language.

Bateson: No, I was thinking of words like "feeling", "self", "intellect". All those words, which are pretty old words, are terribly undefined words even in a psychology lab.

Brown: *Quiditas*, they don't use that word anymore.

SB: What's that?

Brown: That's a Thomistic word for the "whatness" of something. I always remember those definitions from grammar school. We had an explanation for everything. "What is substance? Substance is that which makes a thing what it is." "What are accidents? Accidents are the outward manifestations . . ."

Bateson: This was a much more precise language. This was a very clear language really.

Brown: It divides things up.

Bateson: Not perhaps acceptable today, but it's a lot clearer. I can talk to ex-Jesuits and Thomists better than I can talk to the run-of-the-mill non-Christians.

Brown: Well there is a hierarchy, and a set of values.

SB: The hierarchy, I think, is part of what's missing for most people – epistemology. The sense that there is such a thing, and that it may also be a good thing.

Bateson: The sense that the name is not the thing named – they don't have. OR the sense that the name IS the thing named.

Brown: Either one. Even the distinction.

Bateson: Well, you know they are nowadays in a sense both true. On the left-hand side of the brain, logic prevails and the name is distinguished from the thing named. And on the right-hand side of the brain that distinction is impossible. For it the bread is the body, and the blood is the wine. What the Protestants did was to chuck that one out of the church.

Brown: Who chucked it out?

Bateson: Protestants. They burned each other for that.

Brown: Wasn't the Thirty Years' War over consubstantiation and transubstantiation? That's a fine difference. One is where the host is transformed into the body of Christ. The other is: the bread is still there, but inside it, like a jewel in a loaf of bread, resides the presence of Christ. So one is a consubstantiation, the other is a transubstantiation. On the basis of that, the Lutherans and Catholics . . .

Bateson: Were burning each other. And it was the last cause that people were burned for that was worth being burned for.

SB: I would take it, Gregory, that you're a consubstantiationist?

Bateson: That I'm not quite sure. But I am for the thesis that it is not good enough to insist on either side alone or . . .

Brown: But at least it's a distinction.

Bateson: Oh, it's a real distinction, yeah. Are you going to kick out of the church that part of the brain which says the bread is the body, in favor of that part of the brain that says the bread stands for the body? The part of the brain that belongs in the church is the part that has the fantasies, and the dreams, and the rituals, and all the rest of it. And we have that part of it; it is there. There's no doubt about that. To disown it is not sensible. To live by it alone is not sensible. Therefore, somehow there's got to be a dance between them.

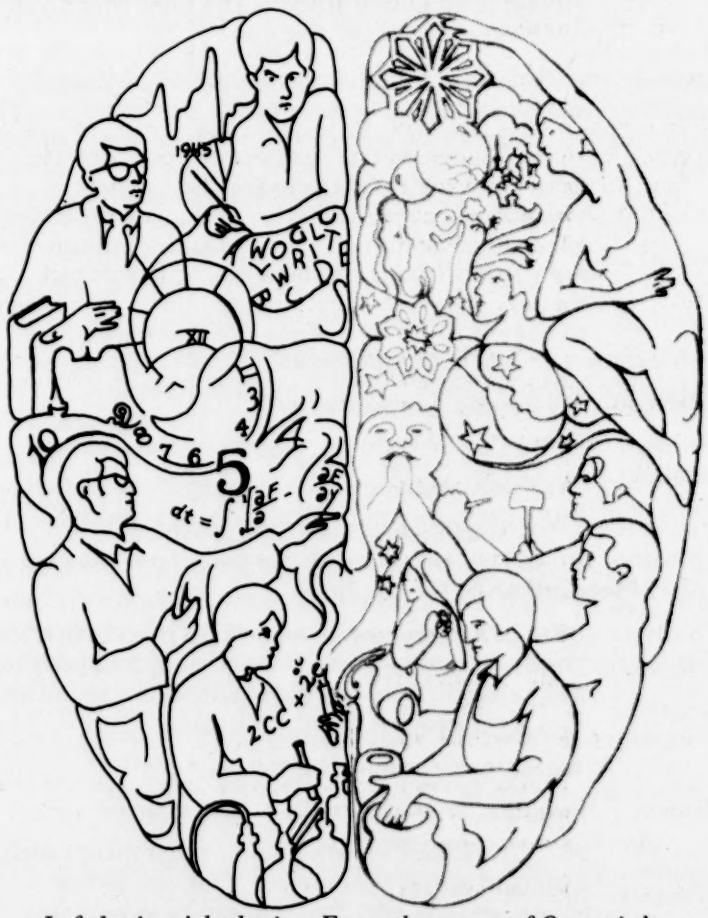
Brown: So you think the rational aspect in man is lessened in today's society? Is that what you're saying?

Bateson: Well, today's society over the last, I guess about 20 years, we've had an enormous increase in anti-intellectualism.

Brown: The growth of irrationality. Isn't that characteristic of an Alexandrian period? Where you go from when your empire expands, and then it gets a little confusing, and then . . .

Bateson: It starts to fall to bits.

Brown: The city-state, as the smaller locality expands and the networks that tie you in to face-to-face relationships break down, then that is generally accompanied by world considerations, mystical consent to irrational kinds of thinking. At least that's what happened in the classical period.



Left brain, right brain. From the cover of Ornstein's **The Psychology of Consciousness** *(EPILOG p. 742).*

Bateson: *"The rise of many prophets."* The Uri Gellers and all the rest of them.

Brown: We're in for some rude awakening, I would say.

SB: "Rude awakening" means what?

Brown: Well, I think the whole concept of America has been one of expansion, and space and lack of limits, and so now we have to learn to live with limits that are being imposed at a time when everyone is geared up for no limits. So that contradiction expresses itself in a lot of pain and suffering for our whole society.

SB: For how long, do you think, before the people catch on?

Brown: I don't know. I'm not a prophet, I'm a politician.

SB: I've heard you say disaster looms.

Brown: I don't really know. The reality that is pressing in seems to be different from the one that people perceive generally, if you look at the expectation of escalated incomes, escalated consumption. Equality, stability, are not close right now. Yet everybody has the sense they are. Oil costs more. If the land has to be regulated in a greater degree, then that's a change. The institutions such as schools, government – and now all these other variations, poverty programs, environmental programs – they are meant to cure whatever the problem is, and they're not making it. So as people lose more confidence in those things, then what? That "then what" is what seems to me to be what's coming around the corner. Maybe clear language allows people to have more confidence, but in addition to clear language you need a vision. You have to have some way to explain where the country is to those who live in it. Like theodicy, you have to explain the ways of God to man. You have to explain history to those who are living it.

SB: Is that part of your job?

Brown: I think it's part of it.

Bateson: It's the job of a leader and of an educational system, I presume.

Brown: That's what education is supposed to do. Education's supposed to equip you to survive, isn't that right? But who knows how to fix a furnace, or to make your refrigerator work, or make your car work. A lot of people don't know that, so we're more and more dependent on the specialists. I think that dependency on specialization is certainly a disruptive influence. Even though it provides the affluence that everyone's enjoying, it also makes people less reliant on their own immediate power.

Bateson: Well, they've always depended on specialists for things of the intellect and things of religion, but it looks as though that is a broken line. There, you see, we don't have specialists we really can depend on.

Brown: We don't have specialists in the spiritual realm.

Bateson: There are no spiritual specialists that we really trust at all. Lots of technological specialists we trust; they'll fix the car, all that.

SB: Not very well. Not as well as you can fix it.

Bateson: But I haven't been able to fix a machine since I came back from New Guinea. I did fine when I was all alone in the wilderness, but since then . . .

Honig: There's an absence of spiritual and moral leaders. If you ask kids who do you look up to, who do you respect . . .

Brown: Do you ever ask them that?

Honig: Yeah. On one level they'll give you sports figures, things like that, but it's like that's an absent figure. An adult that personifies the cultural attributes that they can identify with, it's gone. Like absent fathers, that kind of thing.

There's always this combat between *monus* and *dualus* – life is one but life is divided. I don't think you ever quite hook them or unhook them.

Brown

Brown: Well, the whole system is making fathers and mothers unnecessary. There's welfare . . . there's education . . . TV . . . I think the problem comes down to consumption. Man has never been consuming so much as we're consuming now. We're consuming information. That's one way of looking at it. We're consuming products: food, cars, people, relationships, space, time. It seems to me the acceleration of consumption is such that we've never had to face what we are today, and unless you slow that down, people just get dizzy.

SB: How do you slow down?

Brown: Probably by asking questions, or letting things happen. I mean here they say, "We must have $120,000,000 of State money for this." Slow down whatever's on the agenda. What's on the agenda is more of the same. The model of Vietnam is we need more troops, we need more planes, we need more fire power, and we didn't. Because all that we put in was unable to do the job which was to recreate the community in Vietnam – which we were unable to do. Now that's also true in this country, and we have to re-invigorate the communities . . .

Honig: Have you read this book, **The Lives of a Cell?**

Brown: No.

Honig: You should.

Bateson: Nice book.

Brown: Add it to the list. I think by asking people, that's a way of slowing things down. If you ask something in a way that really seeks out the meaning of the situation or the assumptions on which a statement was made, that requires a pause and requires a reflection that would be missed.

Bateson: So, yes.

SB: Governor, I've heard you talk about "political truth," as something that will get found out by asking enough questions.

Brown: Well, that's the traditional *satyagraha.* Isn't that what Gandhi talked about – *"expose the truth in the situation, and then people by recognizing it are moved by it."* That's the power of unarmed truth.

SB: Does that work for you?

Brown: I don't know. I think something's working. I think it works in a situation where there's all this confusion, that truth has a power that it normally might not have. By truth I mean something that arises out of a situation, and people open their eyes, given the assumptions they all share, they'll perceive it to be the case. And often times it's just there if you focus on it, and you get people to focus on it.

SB: Focus on it how?

Brown: By discussing it, by confronting some of the confusion, by pulling together concepts that are contradictory that people haven't perceived as contradictory.

SB: How do you confront confusion? There is some confusion going on which everyone is sort of glossing over, and here you come, some guy trying to help out. What do you do?

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No quantity ever changed a pattern, you know. Pouring money, which is a quantity, into a system that has a shape will not generate a new shape.

Bateson

Brown: Well, people who are proposing something have an assumption. And if you then say, okay, you're proposing to build a set of houses here, now what is that going to do, and why are you doing it? "Well, this is a government program." Will it really make people better? What will it do to change the neighborhood? I'm asking that about the university. They keep saying they want more money. They have to have more medical training. Now do we need that or do we not need that? People say we have to have more doctors. Is that true? Will the society be better for that?

Bateson: There are more people expecting medical treatment, probably.

Brown: What we're doing now is creating needs, we're producing needs, faster than we are producing the means to satisfy them. So we're really producing consumption at a rather high rate. People who go to school are taught how to consume education, and they are taught their own lack of the educational opportunity that they haven't reached yet, and will never reach, because no matter how much of it they consume, there's always a little more left to be taken out – I think that's true of a lot of things. There's never enough medical delivery, because you're never healthy enough. There's always a new treatment. And as you get older, I'm sure, and as one approaches the end of the road, there's plenty of treatments that can be brought to bear in the war against death. So if that's the goal – to prolong life infinitely – we've got to slowly absorb all the resources available.

Bateson: Why would this be a goal?

Brown: Well, it is a goal. It's one goal.

SB: To not die.

Brown: A lot of the money that's going in is trying unconsciously, I think, to do the impossible. And maybe that's true of some of the learning institutions, or the consuming institutions. They're using physical metaphors. They talk about "health-care-delivery systems." Now health – I am healthy or unhealthy. I can care for you or I can't. But how to "deliver health care" is a very complex metaphor that uses something from heavy industry to go over into spiritual reality.

Bateson: Very good. Thank you.

Brown: And people are using it so often. Like when I wrote the budget message – they talked about how you have to "restrain the abnormal growth in the health-care-delivery systems" – I tried to get away from that word and tie it in to the health of the people. Which then, of course, gives it a different picture. As long as you talk about Health Care Delivery Systems, you can talk about "uniformity of systems," and "sub-units," you can talk about everything except human experience. We just spent five hours talking about how much to increase the . . .

Honig: Five billion dollars spent on education – we spent five hours talking about $100,000,000.

Brown: How to spend $100,000,000 through a formula that is very far removed from the experience of a child in the third grade in the school you teach at. If we gave you $500,000,000, would that change the reality in the schools?

SB: If you pour money into a system that's strange, you're bound to reinforce the strangeness of the system. If you withhold money, and say, "What we're about is trying to redefine the idea of what's good," then (1) you've got their attention by withholding it, and (2) you have the chance of it changing the premises of education . . .

Bateson: . . . It's one of the basic premises that no quantity ever changed a pattern, you know.

Brown: I didn't understand that.

Bateson: Pouring money, which is a quantity, into a system that has a shape, will not really generate a new shape. Now you can with quantities find out what pattern is already latent. If you increase the tension on a chain you can break it at its weakest link, and you found out where the weakest link was. But the tension didn't create the weakest link.

Brown: How would you apply that to school?

Bateson: Pouring money into them is not going to change the pattern. Therefore something else has got to change the pattern if you're going to change the pattern. Maybe then money is needed, to develop the new pattern, to help it grow and all the rest of it, but the latent image that's got to be developed, whatever it is, it's got to come from somewhere else, it doesn't come from money.

Brown: For some reason, people don't want to put money into the schools right now. They don't want to.

Honig: . . . Nancy, when she found out there might be tax increases for school – she was adamant against it.

Brown: Your wife? How do you explain that? You're the teacher.

Honig: She is very upset that a middle-class kid cannot get a basic education in school.

Brown: So what does that mean? That means the school system is an alien force in the community? It's like a boat – it springs a leak, you put your finger on it, and then it springs another leak, you put your finger on that, but you're not moving forward, you're just not sinking. And that's where we are today. The social system is plugging up the leaks, and the ship of state is not sailing on to a destiny that we all share and believe in. That's not happening.

Honig: When you translate that into a classroom, society's struggle is going on right inside the classroom. The guys that are discipline problems is where you spend all your time, and the boys and girls in the middle, they're not getting it.

Brown: They don't get as much attention.

Honig: They don't get what they need. They're like the forgotten person in the system.

Brown: So in effect the most troublesome part of the society is now dictating to all the rest of the society . . . instead of a hierarchy – where those who were transmitting the values, those who had learned the skills, and those who embodied the ideals – they were providing the teaching. Now it's just inverted – all the negative of that, the inverse of that, is what is providing the excitement, the drama, the television, and the status. Now that kind of a situation will not long continue, I don't think.

Margaret Mead, did you ever read . . . *[Big laugh. Gregory and Margaret were married for a number of years.]* I read a book by her once, and she said in a traditional society the older people teach the children, and therefore their scene is very much intact. Then it switches around, and in our society, since everything's changing, she expects the old people to be learning from the children. That is legitimating what is in fact a very disruptive situation. I have my doubts about that.

Bateson: I agree. It does not work.

Honig: She also said that you've got to train and develop a human being, and it takes a lot of . . .

SB: Training is a word you don't hear much any more.

Brown: Well, that's where theology gives you at least some structures. You have the intellect, and you have the will, and you have the passions that confuse things.

Bateson: Look, "practice." I was interviewing a Japanese girl in the war on respect in the Japanese family. She was describing what happens when dad comes home from work. I asked my questions, and it was all beautifully detailed, all beautifully coming out. Then she said, "But in Japan we do not respect the father." "Wait a minute. What have you been telling me?" "Well, you see, we practice respect for the father." "Why do you do that?" "In case we need to respect somebody."

Now, the joke of that is that the Japanese idea of practice is different from the Occidental idea of practice. Occidentals laugh, more or less, when they hear this. We practice in order to get a skill, which is then a tool – in which I, unchanged, now have a new tool, that's all. The Oriental view is that you practice in order to change yourself. You incorporate the discipline of practice in you, and you come out of the practice as a different sort of a person. This is the whole theory of Zen practice, Zen and archery, all those things. Now schools. I was taught, you know, to recite "Horatius at the Bridge," and "The Boy Stood on the Burning Deck," and "To be or not to be," and God knows what. I came out of school with a couple of thousand words at least of rote material. The idea of it all – we were much more Japanese in those days – was not that we would really learn what we were being taught, but we would learn that which one was changed by in the course of being taught. Do you see what I mean? It wasn't to learn Latin that we learned Latin.

Brown: It was to train your mind.

Bateson: It was called to train your mind. Well, it was a great deal more than training your mind, it was training your muscles even . . .

Brown: They always said the mind is like a muscle, you've got to train it. We heard that in memory study. We actually had memory study.

Bateson: You did?

Brown: The Jesuits did. Fifteen minutes of memory study every day. I used to try to object saying, "The mind is not a muscle, it cannot be trained."

Bateson: You were wrong.

Brown: You can increase your memory.

Honig: The thing that makes it difficult in our society, I think, is that the teacher is not a respected, is not a high status person – that's either monetarily or psychologically – and since kids aren't presold on adults anyway, it makes it so much harder for this thing you're talking about to happen.

Bateson: It sure does.

Brown: Life isn't respected, and the ways of the past are not respected, because everything is changing. For some reason we have to tear down all the buildings to put up new buildings because of an earthquake that might occur. Everything's got to be changed. You've got to change your clothes, your shoes, your car, toothpaste, cigarette wrappers, automobile styles. Everything is going through such a process of change that you lose a reverence and a respect for what is. How many people have an heirloom today? How many people live in the city where their grandparents lived?

SB: So how come you're not re-establishing some of the old California state rituals?

What we are doing now is producing needs faster than we are producing the means to satisfy them. . . We're in for some rude awakening, I would say.

Brown

Brown: I'm not sure we ever had any. Our ritual was to come out and rip off a piece of land, and take it and do it.

Bateson: Shake some Indians off it . . . .

Brown: I think we do need symbols. But a ritual can't be imposed artificially. It's got to well out of a moment that is shared by a lot of people, and what is our shared experience right now?

Bateson: Bloody.

SB: In the sense of watching Vietnam, assassinations?

Brown: Vietnam is what liberals tend to say. It may have some effect; it's hard for me to measure. But leaving Vietnam aside, pick the paper up, and just watch it for a week in a very detached way, or watch the news in a detached way. You'll see it's one disaster after another, as though that were the only reality. And obviously it isn't. That's a very small part of it, but the negative perception is the one that is the most attractive for some reason. That's what people consume, that's what television broadcasts.

SB: But that's an extension of gossip, which is always negative. So-and-so is sleeping with so-and-so . . .

Brown: But gossip was always limited to the backfence, and there was work to be done that was not gossip, and gossip was defined as non-work, non-productive, and people felt a little guilty about it, even though they had to engage in it. Now gossip has been made a principle. It's journalism.

SB: Entertainment.

Brown: Entertainment is not entertaining when it absorbs everything – it's bread and circuses. What is entertainment today?

Bateson: Entertainment is sort of pseudo-art which you come out from emptier than you went in.

Brown: Entertainment's a cocktail party. You stand around waiting for that magic moment to occur which is then lost in the general blur or overall fatigue.

SB: Entertainment usually makes it on continually trying to reproduce some real event that happened in the past.

Honig: Movies, you know, the ones I see on TV, these are the images that are going in children's minds. You know when we used to fight as kids, there would be definite rules, you wouldn't go too far this way, you were in control even though you were angry. And when kids fight now it's like anything goes. It's total . . .

Bateson: Really?

Honig: You can be holding two kids apart, and one kid will kick right for the other kid's mouth. It's just like no restraint. It's no concept of the set of rules under which you operate.

Bateson: Like commandos.

Brown: It's what we're all doing now in consumption. Each group has to out-consume the others until there's nothing left for all of us to consume. That's the problem. How do we create a new competition to consume less?

[more →]

The definition of entertainment is: you come out emptier than you went in.

Bateson

SB: That's what you're doing – living in an apartment and driving a Plymouth to work.

Brown: That's still relatively high consumption. But not by the standards of those who preceded me.

SB: What's been the response to your conspicuous non-consumption?

Brown: I don't know. I think people are favorable, because I think it symbolizes a closer connection to ordinary people and it's less pretentious. And since it's a part of what I am, I think it has the ring of authenticity.

I think people have very little respect for government, and those in government have an inflated view of their own importance. So by deflating that, by not carrying the trappings of mansions and limousines and unnecessary body-guards, I've just made manifest what everyone else believes – namely that those in government are just like everybody else. I think that is part of the sympathetic chord that I'm reaching.

SB: Who's threatened by that?

Honig: . . . It's an affront to rich people. Friday that came up. Your "hair-shirting it" was referred to.

Brown: Well, there are a few, I don't deny that. But that's just a very small part of it. People who are part of this game of symbolic status consumption at other people's expense, well, they are a little bit upset at my breaking that down. The game is that if you can get into the public trough and enjoy it, you're there because you're a big man.

I don't think people believe that. I think they're very irritated paying taxes. I think they see the schools aren't teaching. I think they see the army is not winning wars. I think they see the pollution agency is not cleaning up the air. Yet everybody's prancing around the capitol as though they were doing something. And they are working hard, but since it has so little impact, people see the disparity between the compensation, the aura, the ostensible importance, and yet the non-importance when measured against the result. So therefore by putting it down a little bit, I'm just putting it at the scale of people's perception outside of government. Which is just a long way of coming around to saying I am just trying to cut government down to where it is. I didn't put it where it is. It is at a relatively limited point in the present flow of things.

SB: It's going to put your successor in a funny light.

Brown: Why is that?

SB: Well, the poor bastard. Unless he lives across the street . . .

Brown: But it's so convenient. Nobody in their right mind would want to live anywhere else. It's only two blocks away. When you work till 10 o'clock at night, it's very convenient. I have never lived any different than I live today, so I don't see why I should change. If I thought it would make the world better, I might do it, but I think it just adds to the hypocrisy and distance between the presentation of government, and government performance. If you're heavyweight champion of the world, I think a limousine might be appropriate, or you know, some other obvious feat of excellence. But just to muddle around in government, I think a rather modest car is a most appropriate vehicle.

SB: How much of this comes from being the-son-of, I wonder?

Brown: Well, I've had the experience of riding in a limousine and having people pound on the window. That at least makes one think.

SB: Do they pound less on the car you drive?

Brown: They don't recognize it. I think there is a sense in America that it is a democracy. The whole Jeffersonian ideal was that people are temporarily in government. Government is not the basic reality. People are. The private sector. And government is just a limited power to make things go better. Now we're inverting that, and government is all-pervasive. Every time you turn around, there's government. I think that's not part of the American character.

SB: That's a process you'd like to reverse?

Brown: I'd like to reverse it. I think it's an uphill battle, given technology, mobility and information flow. To put government on a smaller scale and still make it work is a pretty good trick if you can do it.

SB: *[To Bateson]* How does cybernetics serve that process?

Bateson: Well, you've got the whole American thing, as he says. In America, the parents are spectators and not the exhibitionists. If Jerry's in a parental role, he should be a spectator. This is where the twist is. It's just in government that the thing limps. The English and in general the European parent, is the object at which the children look. Children are spectators there. The child watches the parent while he shows how. But the American parent is supposed to watch the children and applaud.

Brown: I think that's ridiculous.

Bateson: It's so. I don't know if it's ridiculous; it's the natural history of the place.

Brown: But how does that relate to limiting government?

Bateson: Well, that's the question. As a government object, you're on display more or less. This puts you in a childish role viz a viz your constituents. The audience is always in the parental role in America. In England the audience is in the filial role. When I'm lecturing to an English audience, I can give them what I think is good for them. If I'm lecturing to an American audience, I have to make some bids for approval.

Brown: That's why politicians have to take polls. And this is the lack of a vision. People don't want their own needs recycled.

Bateson: During World War II they wanted to establish polls in England, things like Gallup polls, and Churchill in the House of Commons concluded the debate on this matter by saying it would be undignified. "Is Her Majesty's government to be found at a moment of emergency with its ear to the ground?" Well, that's not the American view of a poll at all. If you read any of Roosevelt's speeches – World War II, you see he's got his eye cocked over his shoulder all the time to see if they're following.

Brown: Were you leading to saying that instead of being the spectator or the consumer of approval, one has to set forth a vision that then people can either follow or not?

Bateson: Well, this is the difficulty. If you set forth a vision . . .

Brown: They can take it or leave it.

Bateson: They'll probably leave it, because after all, you're from the filial end, the child end, the government. The gov-

ernors are always children in America.

Brown: The hell. I don't identify with that at all.

SB: You're what, the youngest governor in the country?

Brown: I don't think that's what you meant. You meant the general role of governor is one of seeking parental approval of the electorate?

Bateson: It puts leadership in a very difficult position in America, or so it always seems to me with an English eye.

Honig: Somebody who is struggling with certain things inside of themselves comes to some understanding and then is able to communicate that to other people who are going through the same struggle. A Gandhian type of thing.

Bateson: Yeah, this is the sort of thing that America is looking for.

Brown: Well, that's what the leader is. Someone who sums up in his own experience the experience of his time, and articulates the unarticulated, *"forges in the smithy of his soul the uncreated conscience of his race."* That's what Stephen Daedalus said. That was rather pretentious.

SB: So you want leaders with problems.

Brown: Not with problems, but whose struggle . . .

Bateson: Agony.

Brown: Governor Agonistes. Well, I think what you mean is the struggle an individual has within himself recapitulates the historical struggle that the people are about to go through. The convergence of the two provides the connection that makes for leadership.

Bateson: Well, now will you say that for the teacher in the classroom? It must be the same problem.

Honig: I think it's not quite on the same scale – a subspecimen of that.

Bateson: How many years can you be a teacher in a classroom and maintain that agony?

Honig: I think you're only good for five or six years.

Bateson: That many?

Honig: Well, it takes you three or four to figure out what you're doing. That's a problem.

Bateson: Well, I found I couldn't work with schizophrenics for more than about six years. You burn yourself out. They burn you out. You put your heart on the frying pan and they don't eat it.

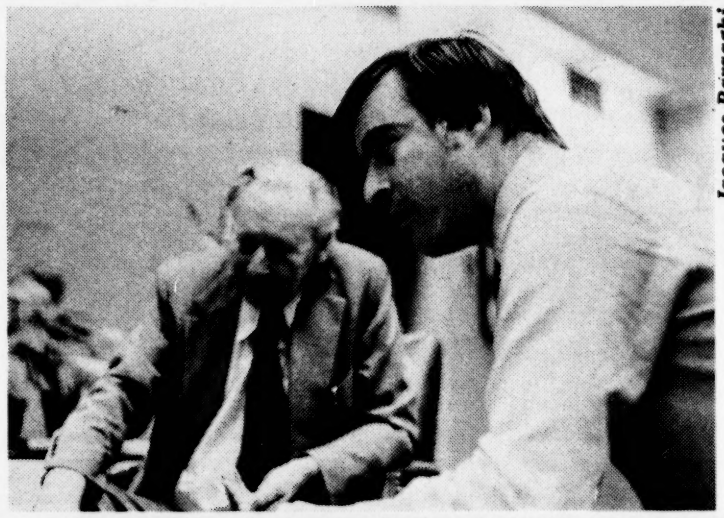
Brown: I think that's true with government.

SB: That's something I would love to know about. What is the recycling period for politicians?

Brown: I don't think it's soon enough for most. If they would just kind of jump out for a while, and then maybe come back. But they stay long beyond their time.

SB: That's something worth institutionalizing, is a throw-out cycle.

Brown: The Greeks had that – ostracism. Ostragon is the potsherd that's dropped in the pot. If the majority drop it in then you're out. There was a fellow named Aristides the Just. Aristides the Just was going through his ostracization process, and he stood there and as some Athenian came by to drop in the potsherd which was an indication for him to exile, Aristides said, "Why are you doing that? Haven't I been a good man?" And the Athenian said, "Look, we're tired of hearing the name of Aristides the Just."



Jacques Barzaghi

I think there's a certain amount of truth to that. But as far as trying to decide what you do next . . . The past practice is that once in power, no one ever likes to give it up. Because it becomes addictive. It becomes co-terminous with your own identity with yourself, and so it becomes very hard to shake loose from. So all this detached philosophizing, but when the moment of separation comes, I suppose . . . They say they throw you out or carry you out. But I think it's probably good to make it a relatively brief period.

I think people in government, from what I've seen, are the prisoners of a very small circle of people. They move from one banquet to another meeting, from one national chain hotel to another of the same nature. You may go to Europe, but you're still staying in the Sheraton Hotel. You talk to the same people, who are playing the same game. And the game is a recognition ritual, it's a reassurance ritual, it's a kind of Here-we-are, the important people, let's-exchange-our-important-thoughts. What new thoughts come into that?

SB: Part of the famousness problem is the caricature that it can encourage. You get famous for being something or other, and then everyone encourages the continuation of that, irrespective of your own heart need.

Bateson: Self-caricature.

Brown: You begin to act your own role.

Bateson: "I paint imitation Picassos almost every day," said Picasso.

Brown: But you have to have some continuity or you're totally confused.

Bateson: That's true too.

Honig: The thing that's interesting about you, though, is that I don't think you've changed that much. I've known you for a long time.

Brown: I don't think I have either. I would get back to this other thought of being able to see something clearly and state it. Now that is not the looking for approval.

Bateson: It is very brutal behavior actually.

Brown: "This is the way I see it. This is the way it is folks." I think people are looking for that. I think there's a great commonality among the people that inhabit this part of the planet. If you just get them to see that core, then I think you'll tap into the strength that's there. And that is done by stating clearly the obvious. Irrespective of short-term reactions. I think all the principles are there: equality, work, sharing things, avoiding waste, adventure, destiny, all of that. That's all there. All we have to do is to let it come out. People are looking for a statement of what is so they can come to terms with it. And instead of being given that,

I don't like drawing sufficient conclusions from insufficient data. That being the art of government.

Bateson

they're just given a lot of second-rate rhetoric that they don't even hear any more. Right now most of the issues are in code. They're in political code, they're in bureaucratic code, but that isn't the language of the ordinary citizen. He's sitting there in his house, or in his car, or on his job doing his work and trying to understand it all, and the separation is so great that his only connection with government is taxes he pays, and the regulation he suffers. Now if we can expose what the bureaucracy and the regulators are up to – which many times isn't very much – I think the ordinary citizen can identify with that, and out of that we can get to a residue of what's important, and that will receive the support it needs to do the work at hand, which is to carry on the teaching, and get the young people working, and create some beauty and harmony and strength and stability.

Jacques: Gregory, is that democracy, what he just said, or is that a leader using democracy? The way I see democracy is: we are three here and we tell him what we want. What he said is, he's going to tell us.

Brown: No, what I'm saying is I'm finding what is historically appropriate for the four of us, and then possibly I can articulate it just about the same time that you would have articulated it. . . .

Bateson: Neither of the one-way systems is going to work. If we tell him what he's to do, he's going to become such a dull boy that we can't stand it. He becomes what is called a bureaucrat. Now if he tells us what to do, we become so dull we can't stand ourselves. Therefore it's got to be *[gesture]* and correct itself.

Brown: That's what you call the loop isn't it?

SB: Circuit.

Jacques: So a combination of the two is democracy, or is it something else?

Bateson: Ah, now you're talking. It might be that it's something else. There are all sorts of patterns in the world, of which we have words for about three. The Balinese pattern is one – if we don't like a decision we makes, we fine him, and one vote blocks anything. Any novelty is blocked by one dissenting vote.

Brown: You've got to have a network of organizations, organically interconnected that work. Then democracy ratifies that common thread that runs through all of them.

SB: But the votes in a democracy are per individual rather than per organization.

Brown: They're per individual but they follow patterns.

SB: You mean, I'll vote the way the people in my church, or my family, or something like that, vote.

Brown: But you can't only have the thing one out of 20 million, you have to have more of a face-to-face experience. You need a personal . . .

SB: Okay, now we're into broadcasting. Here you are, you don't know everybody in the state; not everybody in the state knows you. But more people in the state know you than you know people in the state. That's a funny situation right there.

Brown: Well, I have to find some way of getting in tune with what they're doing. There're only so many types of people, and if you're open to the types that you do encounter, you can extrapolate to what hypothetically is probably the composition of the total population. In your own mind you're always reacting to that. And if you're kind of good at it, you're in tune.

Bateson: But "kind of good at it" is a funny business. I don't know what "kind of good at it" means, but you may know.

Brown: If you're wrong, somebody else comes along to take your place. That's the way it should be.

SB: Who changes your opinion?

Brown: I think the reality changes my opinion, which I guess sounds a little presumptious . . .

SB: Well, how does the reality get to you?

Brown: By everything I do. By the network of people and the events that I encounter. But even when the problem is brought to me, I may redefine the problem, and say that isn't the problem, it's something else. Let's draw a new circle, and let's explore that for a while. I'm very actively involved in advice, so that I don't feel like I'm getting advice. I feel I'm giving it as much as I'm taking it.

It's finding the common point that everyone will agree with. And that means there are two things going on. (1) I can decipher the common thread that is potentially there, and (2) that there is a common thread.

SB: Is that always the case?

Brown: Well, it worked in the farm worker's bill. If there wasn't I couldn't have done it, I don't think. And I don't think I did anything other than – like a midwife – bring things along that were already there. At least that's the way I perceive. I think you have to go with the natural flow of things. You can't force things against nature.

SB: Well, you can, but you'll be sorry.

Brown: Yes, but it pushes back against you. You're sailing against the wind.

SB: How do you know when you're doing that?

Brown: I just try to keep reasonably detached.

Bateson: And your fingers crossed.

Brown: It's luck. Who knows? I don't know. I've only done it for a little while. And to me it's as much an adventure as anyone else. I don't know what the next day will bring. I just know what I happen to know, and I bring that to bear on whatever happens to turn up – applying some good basic principles in which I don't think there are many changes, since I don't think there are many changes in human nature.

[Conversation rattled on and eventually came around to Women's Lib. Gregory concluded,]

Bateson: I think the fallacy of the whole business is thinking in terms of roles, which both the men and the women are doing. A role is half a relationship. And if you begin thinking in terms of relationships, then I don't know what Women's Lib. would look like, what their talk would look like when translated, or a whole mass of things. It might look very different.

Brown: So people are basically what they are in relationship to someone else.

Bateson: Instead of always just seeing just roles, you have to see the relationship and think in terms of it. And at the moment you do that, then you're using certain ideas, and now having introduced that idea, then you've built the ideal for the direction you want to go in.

Brown: This is another way of stating the principle that grace builds on nature.

Bateson: I didn't know that principle.

Brown: Well, nature is the natural state of things which is not capable of supernatural virtue without the additional infusion of grace, which is the gratuitous addition of God's power.

Bateson: What I'm saying is you take a good long look at nature with a vocabulary that is appropriate for describing nature, which is a vocabulary of relationships and not of roles, and then grace can come at your liking . . .

Brown: Maybe I just complicated it by putting in a Medieval metaphor to a modern context. But there's the duality. There's always this combat between *monus* and *dualus,* these are endless debates, and they all keep coming back to that same reality that life is one but life is divided, and you spend your whole life trying to go from one to the other. I don't think you ever quite hook them or unhook them.

SB: It's how you divide it that seems to be continually the question. ONE is not an argument.

Bateson: It's how you divide it and how much you know about the fact that you divided it.

SB: In other words it was not presented divided. Divided is what you did.

Bateson: You did the dividing. You and the women and all that, you know.

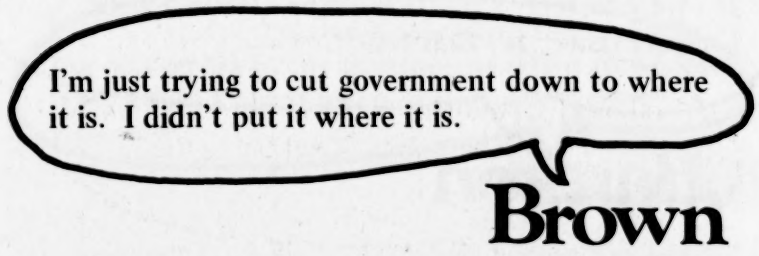
SB: All right, the natural world then is undivided.

Bateson: No, well, the natural world of plants is probably

The Governor's coffee table

We sat round a low clear-glass table. Visible under it was a heap of well-read books.

World Energy Strategies *Amory B. Lovins*
The Perfection of Wisdom in 8000 Lines & Its Verse Summary *Edward Conze*
Multinational Oil *Neil H. Jacoby*
The Updated Last Whole Earth Catalog
Poverty & Mental Retardation *Rodger Harley*
Ecology Law Quarterly
Sweet & Dangerous *John Yudkin*
Human Ecology *Ehrlich, Ehrlich, Holdren*
Briarpatch Review *Michael Phillips, ed.*
Man & People *Ortega y Gasset*
Turtle Island *Gary Snyder*
Deschooling Society *Ivan Illich*
The CoEvolution Quarterly
St. Benedict's Rule for Monasteries *Leonard J. Doyle, trans.*
Out of My Thought & Life *Albert Schweitzer*
Changing State Budgeting *S. Kenneth Howard*
Building the Earth *Teilhard de Chardin*
A Time to Choose — America's Energy Future *Ford Foundation*
The Servant as Leader *Robert K. Greenleaf*
Schopenhauer Selections *Dewitt H. Parker, ed.*
Public Work, Public Workers *Ralph J. Flynn*
Rome *M. Rostoutzeff*
After Deschooling, What?
Wittgenstein — The Philosophical Investigations *George Pitcher, ed.*
The Fourth Way *P. D. Ouspensky*
Currant *Lesley Wenger, ed.*
Sun Moon and Stars *Coyote Man*
Environment, Power, and Society *Howard T. Odum*
Daedalus (The No-Growth Society)
A More Goodly Country *John Sanford*
Energy Primer *Portola Institute*
The Mediterranean *Fernand Braudel*



undivided. But the natural world of people and crayfish and such things is divided by the ideas of the people and the crayfish. Those ideas are part of the natural history of what you have to deal with, as well as your ideas about division.

SB: And this is where clarity becomes of consequence.

Bateson: Yeah, because you care about which are your ideas and which are their ideas. What you did to the data in order to order it. That's where language tricks you, and you get seduced by your own language.

Brown: So you mix up your ideas with your ideals, is that what the point of that is?

Bateson: You mix up your ideas with hard objects. You think that your ideas are forces that you have detected in the outside world.

Brown: So, in other words, you don't create things. You have to try to get away from seeing what you're putting out of your own head, and just stand back and let it all just flow into you and just look at it, uncorrupted by your own distorted gaze.

Bateson: But know when you're distorting it.

Brown: Well, that would be an awareness of what you are, where you are,

SB: Is that what monasteries are good for?

Brown: . . . Yeah, anytime you can get away and just sit there and think about it, away from sensory overload, too many diversionary activities, that's good .

[And so, at 1:30 a.m. to bed. Before we left, the Governor suggested we talk further. "How about breakfast in the coffee shop at the Senator Hotel? 9:30? What a great idea!"

Gregory retired to a room at The Senator. I camped by a levee outside of town. We reconvened at the coffee shop before the Governor arrived.]

SB: What do you expect from this guy Brown. Do you think he'll last?

Bateson: I don't know why not. I think his waist fits him pretty well, his skin is reasonably comfortable. I just thank God it's not my skin, but that's another thing. I don't think his hunches are evil. I didn't get any nasty vibes from him.

He uses lots of words, millions of words. *Reductio ad absurdum* of the use of words. But the words don't pinch At least none of the words he used last night pinched.

SB: I wonder if he's on to something.

Bateson: Yeah, of course he's on to something. He's on to his hunches. That's what he goes to Tassajara for is to get away from all this stuff. It's Zen. Remember that Zen has complete contempt for the use of words, too. I think we could all do with a day a week at Tassajara. Four days a month would be even better. Ten minutes a day and four days a month.

SB: I've heard him say that's what's wrong with government is the use of words.

Bateson: Well, yeah, that's what he really, deeply feels.

SB: Have you dealt with many of these characters?

If I were in Jerry's position I'd be mad in a week. I mean insane. It's that tough.

Bateson

Politicians?

Bateson: Uh-uh. And I begin to see why.

SB: Why?

Bateson: I don't like drawing sufficient conclusions from insufficient data.

SB: That being the art of government?

Bateson: That being the art of government. Perhaps even the art of life. And the art, generally, of dealing with other human beings.

SB: But you do all those things. Live, and deal with other human beings.

Bateson: Oh I know, but it's sometimes awful. The whole business of thinking people have understood what one said, and then discovering, of course . . . The relation between words and thoughts is so damn delicate. Then there's the **I Ching**, which always seems to be talking to you. It would be worth doing a study of the **I Ching**, you know.

SB: What sort of study?

Bateson: All right. I present to you an experimental subject. A man is worried about whether to get married. He throws the yarrow sticks and it comes out this combo of the **I Ching**. What do you think the **I Ching** was saying to him? Let us do that for twenty persons. And I think you will find the agreement between them about what the **I Ching** was saying is very, very small.

SB: And there's some other text that you think would not be so ambiguous?

Bateson: Oh, yes, Euclid. I'm not sure about modern physics. Now Freud, of course, is very like the **I Ching**. The structure of Freudian interpretation is that everything is either itself or its opposite or some sort of sex. The **I Ching** is useful as a way of activating the right brain, bringing it into focus, but it doesn't say a damn thing. It's like stirring a pot— it doesn't add anything new.

SB: You suggest that's the way the governor uses words — is to stir people's pot?

Bateson: And his own. And I think there's a little more than that; there's a little bit of defense there too. He doesn't want to be disturbed. "Don't tell me the answers, I haven't gotten the hunch yet." Well, I would vote for him if I were a voting man.

SB: Yeah, I wonder about that dichotomy, that you're not a voting man. You keep saying, "Good God, man, life is real, it's not politics."

Bateson: Yeah. He goes to Tassajara for the realities. *[Brown arrives, in intense conversation with some legislators about the State budget. When he joins us I ask if he'd prefer the tape recorder off this time. He says to leave it running.]*

SB: Gregory was saying before you came that you use language the way the **I Ching** does.

Brown: Why is that?

SB: It's like the custard pie which takes the shape of whatever it comes up against.

Brown: Of each person's mind. That's like the Delphic Oracle.

Bateson: It enables the reader to be clear about his own mind. It's a very useful function. Psychoanalysis being much the same.

Brown: And you're saying that's . . .

Bateson: . . . the way you use language — to discover what you think.

SB: And from this he deduced that you were an ex-Jesuit.

Bateson: . . . that you felt gypped by the precision of Jesuit language.

Brown: I don't know. I hadn't thought of that. I think you're saying two things. One thing is that language is always used in a way that fits the person listening to it. But another is using language to sort out one's own thoughts.

Bateson: No, neither of these is what I'm referring to. One of the real problems in life is how to get at one's gut response to a situation, whatever it is, what problem is its cause. Now one of the ways of getting at the gut response is by dialectic of some kind. Now that dialectic didn't tell you anything. It only cleared the field for the gut response to come through. This is what the **I Ching** does and this is what Jerry tends to do with language, I think. So the sensible thing is to go to Tassajara for three or four days. And after all this talking, let it come.

Brown: Let it emerge. Well, I think that happens to most events. The truth of the event emerges.

SB: And encouraging that happens how?

Brown: By exposing all the ramifications, and all the different sides and shapes of any event, what its implications are, trying on each possibility for a moment to see where it might lead, whether that's positive or negative. And then when you find the course that fits the vision, then you take it.

SB: It's a fairly evolutionary approach, try everything.

Bateson: And after they tossed the coin they knew what they thought. They don't have to agree with the coins . . .

SB: So politics is about language.

Brown: It's about people.

SB: Ah. Do words get in the way of the people?

Brown: They both get in the way and they provide the way.

Bateson: Still all in all language is the most elegant thing man's invented yet.

SB: Your feeling seems to be that politics debases that.

Bateson: Well, debases where I stand for language, which is different — the sort of precisions that I'm puritanical about. But if I were put in Jerry's position, I'd be mad in a week. I mean, insane. It's that tough.

Brown: Why is that? Because of the imprecision that is inherent in . . .

Bateson: . . . in the need for action with insufficient data at any given moment.

SB: This was Mailer's comment on being mayoral candidate in New York. Somebody said, "How's

"What do you think about people who have ready answers? I think they haven't heard the question."

—Brother Jerry Brown, ca. 1962

Sent by Tyrone Cashman

your literary style holding up?" "Oh God, that was the first to go!"

Brown: That's the thing, if you talk too much, obviously you have that problem. If you talk too much you're going to be very imprecise, whereas if you spend more time asking questions and letting other people talk, then the precision is a little easier to arrive at.

Bateson: Yes, brother.

A lot of it is trying to avoid a precision which isn't appropriate yet.

Brown: Keep people in the dark.

Bateson: Keep oneself in the dark until one knows what one thinks about something.

SB: Hazel Henderson talks about that a lot: the incorrect use of over specifics.

Bateson: Overspecific statements, yes, there's an awful lot of that.

Brown: Yeah, but all those are all just abstractions. Those are commentaries. And they're true and they're not true.

Bateson: That's all very well, but you're in a canoe. You're standing in a canoe, we will say — an art which takes a little learning. Right? It is possible to make that canoe continue to balance and push it with a stick, punt it along. One useful thing I learned when I was a student at Cambridge was to stand and punt a canoe. Well, now how does one do this? One is only part of the system.

Brown: I'm not sure that when you try to make things so abstract that you really convey much information — except in the logical sense. The good thing about politics is you're dealing with something practical. You're dealing with something that's going to alter.

Bateson: Well, you're dealing with an interactive system which is difficult to map logically, this is true. The canoe is also interactive. And the way you balance it is by making it rock.

SB: Continually going slightly wrong and having something to correct against?

Bateson: If you are making it rock, it will balance. If it rocks you, you fall in the water.

SB: That means not only negative goals, but forcing the negative goals.

Bateson: You can't have a marriage and not quarrel with your wife.

SB: Many do. What are they?

Bateson: Damn few. It gets in an awful mess. The information becomes very incomplete.

SB: *[To Brown]* I think the point of the abstraction is, that's another way of saying premises.

Brown: Well, obviously out of that comes your conclusions. If you can get at the premises you know where somebody's going.

SB: Premises are damned hard to change.

Bateson: Your own personal ones are damned hard to change, yes.

Brown: They're hard to identify.

SB: Maybe this is part of what I'm saying about the process of continually being in office. People who stay too long get their premises stuck.

Brown: Yeah, but I haven't been around long enough to worry about that. Now, I've got to go back and make the machine work.

Now we have to learn to live with limits at a time when everyone is geared up for no limits.

Brown

Bateson: He'll make the machine work, and we'll waggle the canoe.

Brown: We'll carry this on again.

Bateson: It's been a pleasure, sir.

[Exit Brown. Gregory, Jacques, and I discuss what will be done with the tape.]

Bateson: Suppose one did a transcript of these things, and at the head of the page you make a list of the people, and the reader has to guess who said what.

Jacques: I like that.

Bateson: You know Alec Bavelas' foursome golf game? He plays golf, you know, with people who are just other professors. Once he took the foursome down to the golf course, and they were going to draw straws for partners. He said, "Let's do this after the game."

SB: Did he try it, did it work, was it interesting?

Bateson: Well, they refused to accept it. They wouldn't play that way.

SB: Do you have much contact with Bavelas?

Bateson: I haven't for some years, but I did at one time have quite a lot and we always amused each other. You know, he's the one with how to press buttons.

SB: What?

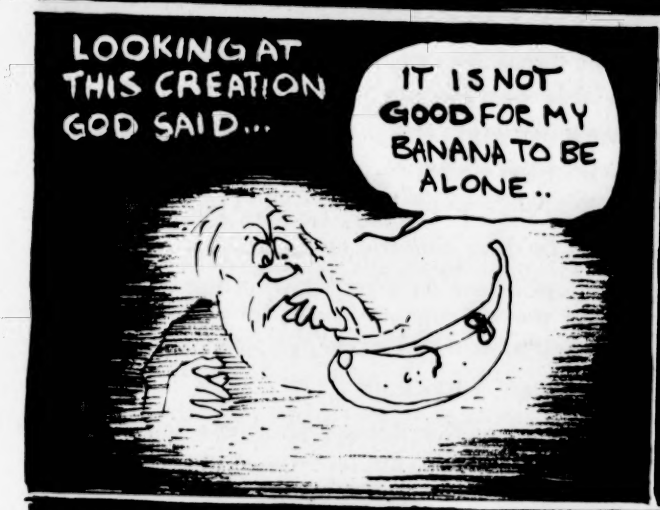
Bateson: The game of how to press buttons. You've got a plank which has fifty buttons on it. And this is in a psych. lab. And there's a bell, and the graduate student and the experimenter. The experimenter says, "I want you to find out the right way to press buttons. When you press them right the bell will ring." And the guy goes [punch, punch, punch, punch, etc.] and when he's punched 67 buttons (there's a simple counting device), the bell rings. And the experimenter says,"'Well, you've got it right at last, can you do it again? Try again."

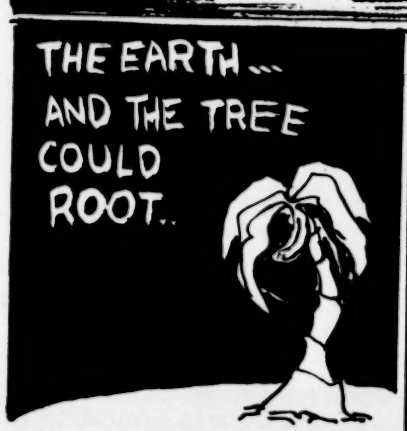
The student doesn't know, you see, whether to do the last three, or try and start from the beginning. However, he presses buttons and at 59, we'll say, it rings. And the experimenter says, "Well, you're doing better. Try again." He always does better. And when it's down to about 23, the experimenter says, "Well, what are the rules for pressing buttons? You were obviously doing better."

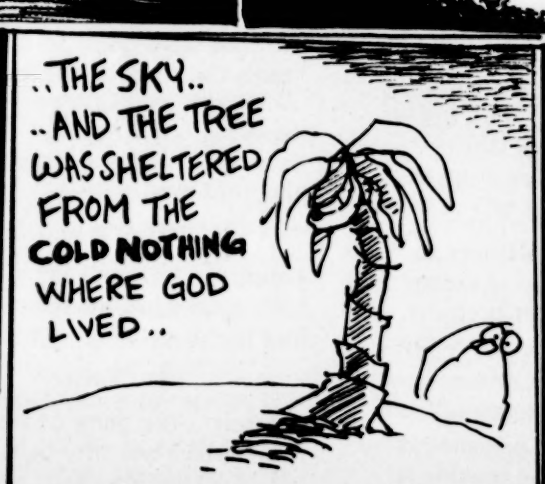
And the man then has an elaborate paranoid structure of the rules for pressing buttons, ". . . and if you make a mistake the way to correct it is by . . . there's this certain way of deleting what you've just done in order to start afresh." And the experimenter says, "I'm sorry, there was no connection with the buttons you pressed and whether the bell rant. It only went by the number." The subject says, "Dr. Bavelas, you are lying. I know there's a connection because, you see, when I deleted them, and did that, it came right."

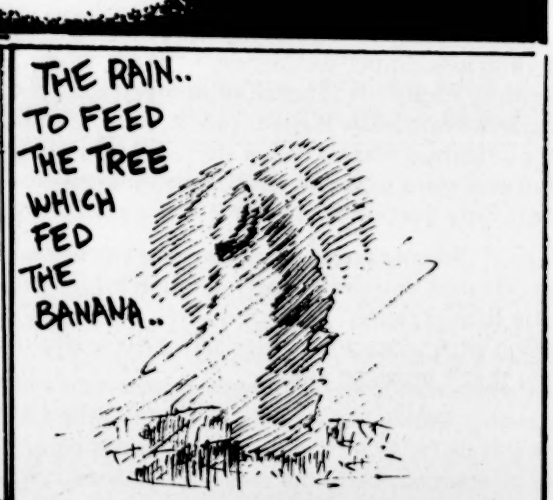
And the only way to correct the paranoia in the subject is to get in a second subject and have the first subject perform the experiment on the second. The first one is then cured and the second one is left with the paranoia. And the whole of science is like that. We are all learning how to press buttons. ■

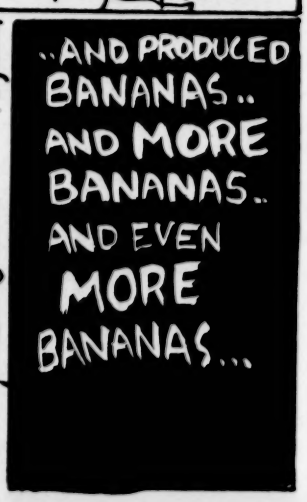
IN THE BEGINNING .. GOD CREATED THE BANANA ..











..AND SOON THERE WERE MORE BANANAS THAN BIRDS..MORE BANANAS THAN EARTH..AND THE GROUND WAS COVERED AND THE SKY WAS FILLED WITH THE FILTH AND STINK OF ROTTING BANANAS..

..AND GOD LOOKED DOWN AND SAID...

GOD.. I HAVE TOO MANY BANANAS

SO GOD CREATED THE MONKEYS..

PRESTO CHANGO!

..AND GOD TOLD THE MONKEYS..

MONKEYS!! EAT BACK THE BANANAS!!

CHIRK! CHIRK?

THE MONKEYS ATE THE BANANAS..

GROWLF!! CHIRKA CHIRKA!!

EEK! EEK!

..MILLIONS AND EVEN HUNDREDS OF BANANAS..

GOBBLE BITE RIP TEAR GRIND SCREAM

EEK EEK EEK EEK

SOON..BANANAS WERE SCARCE.. THE MONKEYS WERE ENTHUSIASTIC

HIDE ME..

THE MONKEYS WERE TOO ENTHUSIASTIC! THE BANANA WAS IN DANGER OF EXTINCTION!!

GOTCHA!

EEK!

THE MONKEY WAS A FAILURE.. SO GOD CREATED MAN..

ACME INSUR.CO.

GOD SAID TO MAN..

MAN.. BRING ORDER TO MY EARTH.. EAT THE MONKEYS BACK.. SO MY BANANA WILL GROW AND PROSPER..

SURE THING, BOSS..

ACME INSR.CO.

..AND ONCE MORE I CAN CONTEMPLATE MY BANANA..

RIGHT AWAY, BOSS..

ACME INSR.CO.

..BUT MAN WAS NOT MUCH BETTER THAN THE MONKEY.. WORSE EVEN... NO ENTHUSIASM!!

ANYTIME NOW, BOSS.. RIGHT ON, BOSS.. TOMORROW FOR SURE BOSS..

TOTALLY DEPRESSED..

..NOT THAT MAN WOULDN'T MUNCH ON AN OCCASIONAL MONKEY..HE DID.. BUT HE SHOWED NO COMMITTMENT..

?

GOD LOOKED DOWN AND SAID..

..NO SMILE..

..SO GOD CREATED A SMILE..

THE HARD WAY..

[more→]

GOD CREATED WOMAN..

..WHICH CREATED TROUBLE FOR MAN...

..I WORK ALL DAY CLEANING UP AFTER YOU AND YOU WON'T PUT DOWN YOUR NEWSPAPER LONG ENOUGH TO SAY HELLO

I QUIT!

TROUBLE CREATED WAR..

I'LL SHOW HER!!

SELL ALL OUR STOCK!!

SELL!

BUT SIR.. THAT WILL RUIN THE ECONOMY!!

YESSIR

WAR CREATED HORROR ...

KILLED IN ACTION

MISSED IN ACTION

HORROR CREATED HUMOR .. AND A SMILE WAS BORN..

QUICK!! DID YOU HEAR THE ONE ABOUT..

JUST IN TIME ...

THE WARS AND THE HORRORS HAD DISCOURAGED GOD.. SO GOD WENT BACK TO THE COLD NOTHING..

LET WELL ENOUGH ALONE..

GOD SAID..

THE MAN AND THE WOMAN WERE CARRIED THROUGH THE AGES BY THEIR SMILE..

AND IT SEEMS THEY WILL CONTINUE TO PROSPER..

MONKEYS

THE MONKEYS THAT AVOIDED THE MENU WENT TO THE ZOO..

THE BANANA WAS CAPTURED BY THE UNITED FRUIT COMPANY

AND GOD.. OUT IN THE COLD NOTHING.. WAS ASKED LAST WEEK.. "ARE YOU DISAPPOINTED?" .. AND GOD SAID..

YES.. I HAVE NO BANANAS..

Gaia's cybernetics badly expressed.

My dear Stewart,

CQ's Summer issue found its way to me in the boondocks where in a natural ecology I enjoyed CQ's fabulous bits and pieces of ecological nature. All of us who wish to see or to help healing the wounds cut by reductionism shall be grateful to you for having brought together people whose visions, concepts, and language are much needed medication. Your authors' unity of intent is evident everywhere in this issue, and give CQ a coherence that in itself is a potent remedy.

On the other hand, unity is still absent in the use of a terminology that by necessity pervades CQ's universe of discourse. Should we all be right, then such unity will co-evolve when this terminology is being kicked around in our "conversation pit."

However, it is difficult to converse if too much noise enters the conversation as, for instance, through the three equations in your excerpt from "Atmospheric Homeostasis by and for the Biosphere: The Gaia Hypothesis" by Lovelock and Margulis which appears in the box on Summer '75 CQ's pages 36 and 37:

1. Conceptual Noise (?):

$$\rho \frac{dS}{dt} + \text{div}\, S = \Phi \text{"}$$

is incomprehensible on purely syntactic grounds:

(i) Each of the three terms involved has a different physical dimension, hence they cannot be added [a(apples) + b(bananas) = c(cherries) ?].

(ii) Divergence (div) is a differentical vector operator operating on vectors only; but entropy has no direction.

(iii) Entropy is not a point function as, e.g., temperature, barometric pressure, etc. (otherwise its additivity would give for any finite volume an infinite value), hence entropy cannot appear in a "continuity equation" of the form suggested.

2. Printing Noise (?):

$$\text{"} I = (E + PV - TS - \Sigma N_i N_i)/T \text{"}$$

The right hand side of this equation looks to me like a Gibbs Free Energy with a malignant tumor attached to it ($\Sigma N, N_i$). Maybe this tumor is benign when transformed into

$$\Sigma \mu_i N_i$$

with μ_i and N_i representing the chemical potentials and the number of molecules of species "i" respectively.

I am unable to (re)-construct the proper representation of these equations' intent, for their intent is to be read from their representations. Moreover, sitting in the boondocks I have no way to find out who is to be charged with these booboos: CQ who misprints Lovelock and Margulis; Lovelock and Margulis who misquote Denbigh (1951) and Evans (1969); or Denbigh and Evans who misunderstand. But this is not my job. On the other hand, I found Lovelock's and Margulis' ideas too important to see them becoming vulnerable because of deficiencies of a different kind. As a comment on their – or anybody else's – classification of Life I suggest that you reproduce "Autopoiesis: The Organization of Living Systems, its Characterization, and a Model" by Francisco Varela, Humberto Maturana, and Ricardo Uribe, from **Biosystems**, 5 (4), 187-196 (1974).

3. Epistemological Noise (?):

"Thus the information (I) of a system can be defined as

$$I = S_O - S$$

where S_O is the entropy of the components of the system at thermodynamic equilibrium and S the entropy of the system assembled."

Now, dear Stewart, if I tell you (and you listen) that I have here on my desk a system whose volume is about 200 cubic centimeters, and whose entropy is very roughly a few kilowatthours per degree centigrade, you may take this to

be some information about my system. These numbers are now your information of my system, and neither the volume nor the entropy are the information of my system. In fact, my system has no information: it is a can of lighter fluid. This can remains uninformed even if someone were to define its volume or its entropy to be its "curiosity" or its "information," invoking cognitive faculties at places where there are none.

I would hope that we shall never tire of reminding ourselves and each other that "complexity," "disorder," "entropy," "information," "order," "organization," "simplicity," etc., are not names for properties of things, but those for properties of descriptions, or – if you wish – are names reflecting properties of the observer (describer), his vocabulary, his natural or chosen limits of discrimination, etc., in short, his idiosyncrasies at the time of his observations (see Lars Lofgren: "Recognition of Order and Evolutionary Systems" in **Computer and Information Science 2**, J. Tou (editor), 165-175 (1976)). With this in mind it may be amusing to read again the various conjectures on pages six and seven of your Summer issue, or other related pieces.

Cheers and Congratulations to all CQ-ers
ever yours
Heinz Von Foerster
Pescadero, California

Heinz Von Foerster is in the process of retiring as head of Biological Computer Laboratories at the University of Illinois. Last week someone wrote a letter to Science *noting that his population equation of some ten years ago – which predicted a population of infinity during the second decade of the 21st century – is right on schedule.*

–SB

I am going to build a church some day. It will have a holy of holies and a holy of holies of holies. And in that ultimate box will be a random number table.

–Gregory Bateson

Sent by Judith van Slooten

The difference between unity and uniformity

BY E. F. SCHUMACHER

If we are going to talk about decentralization, we must obviously give this some sort of metaphysical basis, because without a metaphysical basis, any subject——outside the natural sciences——has no meaning at all. That means we have to use (to start with—— don't get worried) some pretty wide concepts. The concepts I wish to start with I've written on the blackboard. There you see the word "unity" and underneath "diversity and multiplicity" and still lower down "uniformity."

Now we are all of us familiar, very familiar, with the middle terms. We find this vast diversity and multiplicity in nature, in society, and in ourselves. Great variety. When we approve of this variety we normally call it diversity, and when we're fed up with it we call it multiplicity. You can't have this multiplicity!

We're also sadly familiar with the bottom term "uniformity" because it reflects the main tendency of the modern world. It's what the modern world imposes on nature, for instance, agriculture, monoculture, exhaustion or diminution of the "gene pool," as they say, etc. In society, monster organizations, monstrous production units, mass production, standardization, mechanization, and with man, mass education. In fact I owe this insight to Ivan Illich, that the mass production of people, mass education, compulsory mass education, was introduced a hundred years before mass production.

One of the things I learned at Lindisfarne, where this talk was given last summer ('74), is that E.F. Schumacher is called Fritz. Another is that he is a considerable Christian – a converted Catholic I believe. Since Lynn White, Jr. and others have accused Christianity of being the root of our ecological excesses, it is interesting to hear the opposite case from Schumacher.

Economist Schumacher is the author of **Small is Beautiful** *(EPILOG p. 466). This talk is available on cassette for $6.50 from Lindisfarne Association, Box 1395, Southampton, NY 11968.*

–SB

What I want to particularly emphasize is that unity and uniformity seem to look very much alike. And the most important thing is that we should train our minds, train our eyes to distinguish between unity and uniformity.

What do we mean by unity? This is the level, if I may put it that way, with which we're least acquainted. Unity is difficult to attain, it's very difficult to attain inside ourselves. Even a saint like St. Paul had to struggle against this lack of unity inside himself. *The good that I would, I do not; but the evil which I would not, that I do, oh wretched man that I am.* With the mind I myself serve the law of God; with the flesh, the law of sin. So unity has something to do with God.

And diversity and multiplicity have something to do with our Earth.

And uniformity has something to do with hell. And the difference, although the words sound the same, between unity and uniformity is the greatest possible difference. But, as you know, and as our forefathers knew, Satan is the ape of God. And our main efforts must be to try and distinguish which way we are going. Because this middle condition, or earthly condition, or worldy condition, of multiplicity is an intrinsically very unstable position. Unstable, troublesome, strenuous, uncertain, dangerous, easily giving way to violence. Also today I would say, inflationary. It's a condition that one always wishes to get out of. It causes a sort of existential anguish.

There are two ways of getting out of it: the upward way to God, or the downward way into hell. For "up" one can say "inner." For "down" one can say "outer," but we haven't really time to go into all the terminological problems that are raised immediately when one talks about these things. If the upward movement is made impossible, for instance, by the belief that man is nothing but an outcome of mindless evolution, the sort of thing that we learn from Nobel Prize winners like Jacques Monod, in his book **Chance and Necessity**, then this is cut off. Then

"Simplicity is a value in itself from a Christian point of view."

"If you mainly direct your mind to quantitative aspects, you're getting down into hell."

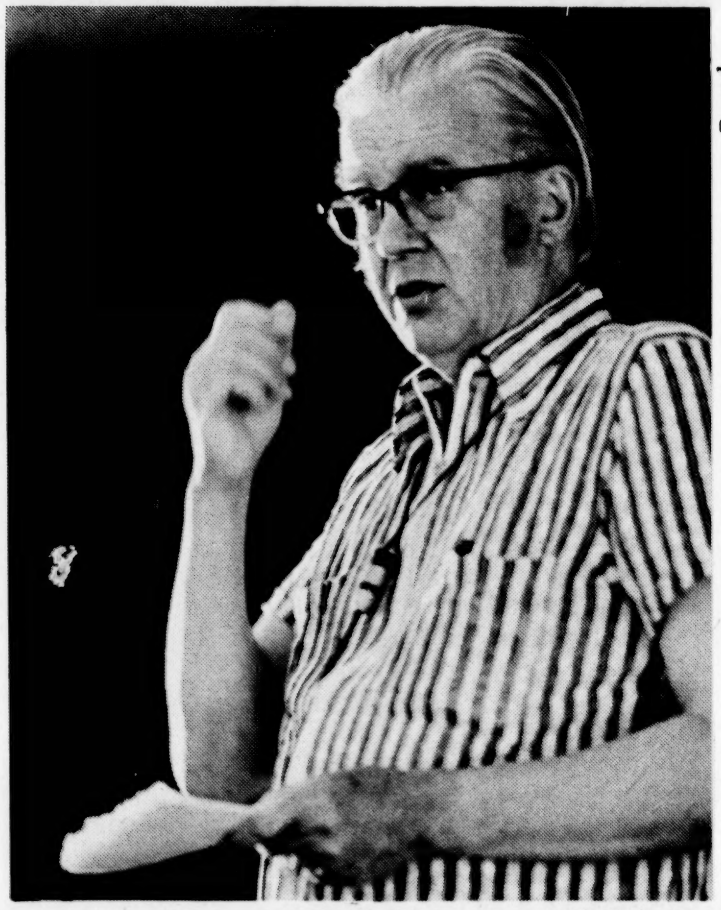
---

there is only one possibility to get out of this existential anguish out of multiplicity: into uniformity, which is as I said, the ape of unity.

Going a little bit further, we can make a number of further associations. Unity-- the level of God, as it were-- let's associate this with the concept of quality. And, if you like, the concept of the spiritual. The Earth level I will jump for a moment. This level, there's no doubt, we have to associate with the concept of quantity. And certainly, in a certain sense, with the concept of the material. Here we have a mixture of the two. I want you particularly to think about quantity and quality. Of course pure quality, that is to say, without any quantity at all, or pure spirit without any body, without any matter on the one hand, and on the other hand, pure quantity, without any qualitative determination, or pure matter without any spiritual content, that doesn't exist in manifestation. That is beyond manifestation.

I don't know if any of you know the works of René Guénon. His last book was called **The Reign of Quantity**. And as this reign of quantity increasingly establishes itself, sort of solidifies, we achieve ever increasing uniformity and life becomes hell. When, or if, or as the quantity is pushed away, and the reign of quality comes, then we move upwards toward unity, which as we know, is also called "the kingdom of God." Now let us see if we can look at the problem of structure, centralization/decentralization. There can't be anything in manifestation, I mean extant on this earth, without some structure, because it must have some material component. And the more material it is, the more structure it requires. I'm talking on the physical plane. And the more immaterial it is, the less structure it requires.

So if we think about centralization, that means a simplification of structure, a reduction in the number of centers, the extreme being a monolithic structure. Is it going to lead us upwards, to the fulfillment of human destiny, or does it lead us down into hell? Does it lead us towards unity or towards uniformity?



Brand

E. F. Schumacher at Lindisfarne

Equally if we talk about decentralization, what is it that is being decentralized, and will this process, this attempt to decentralize lead us into unity or away from unity, or perhaps even into uniformity? Now how do we decide if it's going to lead us upwards or downwards? That is the crucial question. What is being decentralized or centralized? That is what we first have to know because there's a scale, from the purely material to the purely immaterial, and the greater the material, the greater is the relevance of quantity. And the more immaterial, non-material it is, the smaller is the relevance of quantity. And in fact, in the extreme, quantity doesn't arise at all because immaterial things are not quantitative.

We can say for instance when it comes to actual production, handling material, working in an actual physical situation, there quantity counts. There it's a matter of the highest importance with how many people can I work? Because the number of people I can work with as persons is very limited. If you have one person there is no relationship. I don't count my relationships to myself as a relationship. If there are two of us, there is one relationship. If there are three of us-- one, two, three. If there are four of us, there are already six. If there are ten of us, there are 45. If there are 12, there are 66. Now Jesus evidently thought that was enough, that was all he could handle. When there are a hundred there are 4,950 bi-lateral relationships. Who can carry those in his head? And so for most of us then, they are no longer persons, they are just numbers. So if we work actually in the material, in the physical realm, then quantity counts tremendously from the metaphysical point of view that I am taking. Because quantity, if excessive, suffocates. In other words,

and all sociologists know this, they call it "primary work groups." Primary work groups must be small, and the general consensus is that Jesus was right, about a dozen is all one can handle.

But when we come to the relatively more immaterial things, not actual work but perhaps ideas, floating ideas, setting norms, then of course quantity doesn't enter. And quantity can't suffocate. So this is quite a different matter. We don't dehumanize an idea if the idea is communicated to all mankind.

So how many centers are required? At the extreme, at the top, there is only one center, the immaterial center, and that is the Divine. One can say in work that bigness, large quantity inevitably tends toward uniformity. There we want decentralization. But bigness, universality, worldwide impact of ideas, provided that the ideas are good, can lead to unity. If they are bad, they will probably also lead to uniformity, but that has to be worked out.

With material things enough is enough, and there are limits to growth. But with ideal things, immaterial things, matters of the mind, the heart, the spirit, the very concept of "enough" is inapplicable, because it's a purely quantitative concept. And there are no limits to spiritual growth. To think about limits to spiritual growth is just meaningless. So where do we need many centers, and where do we not need many centers, that is the question of centralization and decentralization. Well, I think, I have at least given some indication of my own thinking that this has to be orientated in accordance with the scale from the crudest material to the highest spiritual.

The position of every person, of every one of us, is that we need on the one hand to be able to do our own thing, even to ourselves be a center, that the power of doing is decentralized to me, to you, and at the same time as a spiritual being, we have only one orientation, to only one center. And only if we have that orientation can we achieve the brotherhood of man, if you will permit such a sentimental sounding but very meaningful word. So on the one hand, at one level, we need to be split up into many, many groups and the unity has to be achieved by some higher force that coordinates the thinking, feeling, striving of people. It cannot be done by material organization, or to put it another way, material things have frontiers, without frontiers they couldn't exist, they would be everywhere and nowhere. Whereas ideas have no frontiers.

What follows from all this, and I'm sorry I've taken so much time about it, is that we must get away from asking whether centralization is a Good thing (with a capital G) or decentralization a Good thing. We have to be very precise about it. One of the great teachers of the Western world, Thomas Aquinas, started every second one of his paragraphs with the word *distinguo*. Now first of all let's distinguish what we are going to centralize or to decentralize. To get a unity, to strive for unity on the ideal plane, for instance, the universality of the rule of law, that's one thing, but it does not follow that we would get anything but dreadful uniformity if it worked at all—— if we translated that lightheartedly into material arrangements and thought that the world state would solve our problems. We might say that once a really good thing has been invented that its knowledge should be universally available and universally applied. But if we say the production should be centralized, as is the tendency of the modern world, with multi-lateral corporations, multi-national corporations, etc. that is quite a different kettle of fish.

Let's start again and try to encircle the whole problem from another angle. I know the question has become exceedingly unpopular, but not, I trust, in this circle. After all, everything that we do and talk about should be orientated to, and derived from the question, "Why are we here in this world anyhow?" Now it's not all that pleasant to be here, and it's a very short time. What's the point of it? And life actually, for most of us, is too short to find out on our own. But luckily we have not been left without guidance, and that guidance is in fact called the universal tradition of mankind, manifesting in religion. We have the inestimable benefit that today the knowledge of all religions has become accessible, even in paperback—— we don't have to be immensely learned. It's all available in translation and if we pay attention to it, we find, as someone yesterday pointed out, the convergence. Not that the religions themselves are converging because truth is truth (truth doesn't converge), but our understanding converges. The deeper insight is that where it matters, they all teach the same.

Now what do they teach? I will put this in the language of a great Christian saint, Thomas Aquinas, who wrote a very famous book, and he started by laying the foundation. And the foundation says this, *Man was created to praise, reverence, and serve God our Lord, and by this means to save his soul. And the other things on the face of the earth were created for Man's sake, and in order to aid him in the prosecution of the end for which he [Man] was created.* And then it goes on to say in the most precise logic, *From which it follows, that Man ought to make use of these other things just so far as they help him to attain his end, and that he ought to withdraw from them just so far as they hinder him.*

This is a saint talking, not a businessman. Of course, the businessman if he's got any sense, says exactly the same. He first determines "What am I trying to do?" and then he uses the means of his environment just so far as it helps him to do it, but he withdraws the moment he finds he is doing too much and it hinders him. So the logic is impeccable.

All the same, to the modern world, and to many of us, or to many strong parts inside of us, this is a totally unacceptable prescription. But perhaps the real predicament we find ourselves in is precisely due to the disregard of this rule. We are not using the facilities the Creator has put at our disposal for the purpose of attaining an end. We don't even make up our mind what our end is. We are using them, well, because they're there. Our engineers and scientists produce something more we could do, so we must

"I came to Burma and there I found life as it ought to be. Bags of time, great relaxation and happiness, the most joyous people you could possibly encounter. . . .

Then it struck me that the amount of time people have is in inverse proportion to the amount of labor-saving machinery they employ."

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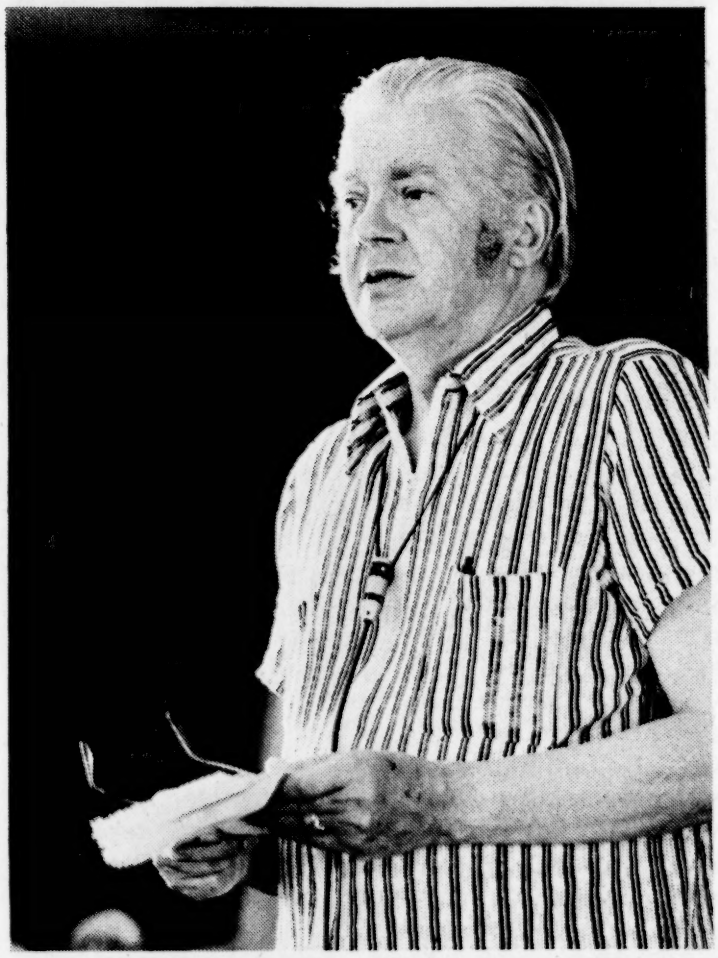
do it. It's got nothing to do with any clear purpose of man, to save his soul, or anything else, to land people on the Moon. Or if someone has come to such a condition that his heart is totally ruined, to make a heart transplant, or etc., etc., etc. We do it because it's possible to do it.

We're a society that's rich in means and poor in purpose.

I wasn't all that much against the Moon landings. I had myself quite a list of people I wanted to send, but when I found they always fetched them back again, I thought it was completely purposeless.

From this point of view that there is a purpose in human life—— that we are entitled to use the means of the world just as far as we need them to attain this purpose, or withdraw from them when they begin to hinder—— from this point of view, it is impossible to take any interest in a discussion of economic growth. And it's equally impossible to get excited if somebody says non-growth or zero-growth. Because these are purely quantitative concepts and therefore have no intelligible meaning at all. We also want to be enlightened. It is quite amazing how difficult it is to convince even well meaning people that it is depraved to argue about growth or non-growth. It misses everything that matters. The purely quantitative concepts only fit at the level of uniformity, of hell, as if everything was much of a muchness. I mean, is physical growth a good thing? Well, when my children grow it is exactly as it should be. But if I should suddenly start to grow it would be a disaster. Is growth Good or is it Bad, is decentralization or centralization Good or Bad? These are purely empty quantitative concepts. So that's the first point. We are not interested in growth or non-growth. That which is required, and healthy and good, should grow. And that which is not required, unhealthy, and evil, should diminish. Whether the addition of these two processes—— which evil minded statisticians do and add up in GNP—— whether that GNP rises or falls should be of no concern to anybody with any sense whatsoever.

Now the second point is, "What is therefore the qualitative effect that has to be found?" To



examine this closely I spent a couple of years, as a farm laborer, and one of my jobs was every morning before breakfast to go beyond yonder hills and count the cattle in a field. And I did this half-asleep, went back to the farm, touched my cap to the bailiff and said, "Yes, sir, 32." And he said, "Go and have your breakfast." And one day I arrived at this field, and there was an old farmer leaning on the gate, and he said, "Young man, what do you do here every morning?" This was war time; maybe he thought I was a spy. I said, "I do nothing, I mean, I just count the cattle." And he shook his old head and said, "If you count them everyday, they won't flourish."

So I started back, thinking how stupid can they get. I was a professional statistician, after all. And one day I arrived at the fields, and I counted and counted again and there were only 31. Well I wanted my breakfast, and I went back, touched my cap and told the bailiff, "Well, there are only 31." "Oh, that's bad," he said. "Well, go and have your breakfast and we'll go there together." We went there together, we searched the place, and there was a dead beast under one of the bushes. I said out loud, "Why have I been counting them all the time? The thing has died. It would also have died if I had never been there, for all I know."

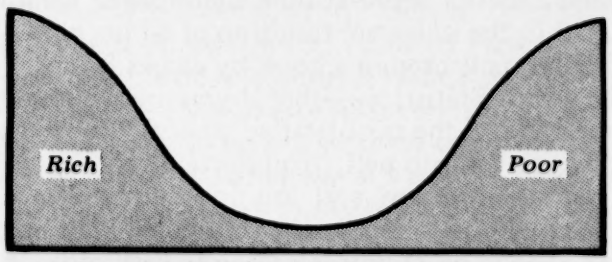
There I got for the first time a glimpse of what is meant in the universal tradition of all people—— dutifully collected in a book by James Fraser, **The Sin of Statistics**——that if you mainly direct your mind to the quantitative aspects you're getting down into hell. You're treating everything as units, as uniform, and you don't notice the qualitative things that really matter,—— namely to look at each beast with a degree of qualitative

understanding and say, "Well this one looks a bit mingy."

A farm laborer in Scotland was asked by the boss to count the sheep. He had them all in a sheep pen. They rushed out, and after they'd all left, the boss asked, "Well, how many are there?" He said, "I don't know, but I know the one that is missing." You see, he knew his sheep one by one: he didn't have to count them. He missed a friend, and that is far more real information than 32 or 31.

Now about your reference to econometrics. Of course, we cannot actually totally disregard quantity, and sometimes we can make figures sing, and that is the real task of a statistician. You will not catch me producing big tabulations, because they don't sing, but you do catch me producing what I would consider significant figures where the quality expresses itself in the quantity. For example, if you take the normal distribution of anything, what sort of a curve do you get? You get the famous Gaussian bell-shaped curve—— a few are at one extreme (there are always some stragglers), a few at the other extreme (there are always some geniuses or exceptionally greedy people), but most people are in the middle. But if you take the world distribution of income you get an inverted Gaussian curve. Many, many people extremely poor, very many people extremely rich, hardly anybody in the middle. You can see there the quality of the distribution: it's a pathological distribution. That is to say, there is not one world any more. Even on that humble level, any semblance of unity has been lost. And this doesn't merely apply between the rich countries and the poor countries (where it applies in a horrifying form) it also applies inside many societies. All the developing countries are becoming ever more dual societies, with a lot of people immensely poor, a few people immensely rich, and nothing in the middle. Evidently some people don't observe the idea that they have other purposes in life but the material—— to put it into the shorthand of Christian language—— that their job is really to save their soul, and that they are using far more of the material means than is necessary for this purpose, and that therefore they are greatly hindered.

So we see that the rich society, that is to say the very few people at the rich end, cannot possibly be a model for the world as a whole. And unless we find a new model, we are just going to drift deeper and deeper into disaster. The rich society says to the world at large, "If only you would adopt our technology and our methods you can all live like little Americans, or little Western Europeans, or little Japanese." That is just plain nonsense. It can't be.



Inverted Gaussian ("bell-shaped") curve

Now, all the culture that we have comes from the culture of poverty. I mean to say if you go to Chartres or to Bern or to anywhere, a thousand places, or to the Taj Mahal, you find that they have been able to do cultural things that we can't rival economically. That's the extraordinary thing. We can't even afford them . . . because our cultural affluence is so immensely wasteful on the ephemeral side, that anything permanent, like building something splendid, we can't do it. Also because we subject what we want really—— what we mean to do for eternity—— we subject it to an economic calculus, which is a contradiction in terms.

I had the privilege of going to Florence only a year ago. There I looked at a cathedral, and opposite the cathedral, this fantastic cathedral, there is the statue of the architect. His name is Arronulfo. And he looked admiringly at his work. On the pedestal was a Latin inscription, which with greatest difficulty I deciphered, and which said, "This is Arronulfo, who, instructed by the municipality of Florence to build a cathedral of such splendor that no human genius can ever surpass it, on account of the splendid endowment of his mind, proved equal to this gigantic task." Not "instructed by the Medicis." This was the republic of Florence, in a pre-industrial age, when GNP was such a tiny fraction of what it is now in this country, or even in Italy, that we would say, Well, they must have perished! How could they build such a thing?

They didn't apply economic calculus; they just did it. They instructed it should be done.

I have tried to imagine what it would be like if I found a statue of the architect opposite one of the highrise, office block buildings in London. It would probably read "This is Mr. R. W. Smith, member of the Royal Institute of British Architects, who, instructed by the Greater London Council to create an office block of such superlative cheapness per square foot, that no human genius can ever underbid it, on account of his superb endowment with computers, proved equal to this mean task."

We have in a way advanced into hell.

We have put everything under some concept of efficiency. And of course no one in his senses would be in favor of inefficiency. We are all in favor of efficiency. But the concept has become unbelievably narrow. It only takes one thing, and that is efficiency in the most material aspect of the job. If I would say, this is a splendid process of production and a very efficient process because it makes the workers happy, people would say well what's the matter with him, he must be a sentimental fool. I must prove that they work better, or work faster, or produce better quality work with their happiness. If I can't prove that, happiness doesn't count.

This of course has been noticed for a long time, but the warnings have gone unlistened to. I read one of the classical statements, an encyclical by Pope Pius XI: "With the leaders of business abandoning the true path, it was easy for the working class also to

"All the culture that we have comes from the culture of poverty. . . . A Chartres or Taj Mahal – we can't afford them."

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fall into the same abyss." If you want to ask me what is the cause of inflation, this is it. All the more so, because very many employers treated their workers as mere tools. And so bodily labor, which was decreed by Providence for the good of Man's body and soul, was in many instances changed into an instrument of perversion. And then this, to me, terrible sentence: "From the factory dead matter goes out improved, whereas men there are corrupted and degraded."

I'm not saying that people aren't aware of it, but they take it as a law of nature. There is a total immobilism, there is just a little bit of tinkering, it is treated the same way as slavery was treated until it was abolished. Of course we want to be kind to the workers, of course we realize we must do something, we must treat them with respect, and even if they physically come to grief, (if they mentally or spiritually come to grief we couldn't care less) then we must pay some compensation. But the one thing we must understand is that compensation never compensates. Once the damage has been done it cannot be undone.

So this concept, this very Good-orientated concept of efficiency, that has led us into the whole mythology of the economies of scale. More specialization, more division of labor, more uniformity, more mindlessness–– production becomes ever bigger, ever more complex, ever more capital intensive, and in a special sense, ever more violent.

Well, you say, why is he telling me all this, we know it all. I apologize. But then where do we go from there? A diagnosis is worth taking a little bit of time over. So we have the people who say we must change the system and they're quite right. Except one never knows what they mean. Society has produced this production system, but now the system molds society. It insists that every member of society respects the eminent logic of the system and adapts to it by accepting its implicit aims as one's own. The first commandment is "Thou shalt adapt yourself." In this way man becomes captive of the system whether he approves of its aims or not. And he cannot effectively adopt different aims and values (he can verbally do it, but not effectively), unless he takes steps to alter the system of production. In other words, ideas can change the world only by some process of incarnation.

The prevailing concept of efficiency rules the modern world not by itself, it rules it by the type of technology and the type of organization it has produced. A mere change of the concept remains wishful thinking. In other words, unless and until somebody has got to work and has produced new technologies,

This is Arronulfo, who, instructed by the municipality of Florence to build a Cathedral of such splendor that no human genius can ever surpass it, on account of the splendid endowment of his mind, proved equal to this gigantic task.

new types of organizations–– until that has happened–– all the preaching (which is also necessary), all the appeal to peoples' goodness, their good sense, their ethical, spiritual qualities, all this will invariably stay inside the system, and will be powerless to alter the system. It will not be altered unless there is an incarnation, that is to say, unless some people have actually got to work to produce new types of work, new types of organization, new patterns of consumption, new patterns of distribution of the population . . . have produced this and have shown it to be viable. Now that's very hard work.

Of course, we are taught in the beginning is the word. But read on. It was made flesh and dwelled among us. Now it may not be recognized, it may not be accepted. Of course it will be called impractical, or even subversive. But whether it will eventually succeed in changing the world will depend not simply on its intrinsic truth, but on the work it manages to mobilize in the flesh.

Finally, just a short look at what kind of work. For work we have to have some guidelines, some orientations. I have come to the conclusion, that these suicidal tendencies of the modern world, quite apart from their disastrous spiritual implications, can be summed up in four criteria. Any such listing is to some extent personal and arbitrary, but I would sum it up like this.

First of all, the tendency towards giantism, the economies of scale, all that.

Second–– all these are closely interconnected–– the tendency towards an unbelievable complexity. No doubt you have seen cars where progress was represented by the fact that you did not have to subject yourself to the indignity of turning a little handle to wind the windows up and down. You press the button and "bzzzzzzz" they went up. These

things of course break down and cost a lot to repair, and the simplest things one can't do oneself any more. Everything has become too complex. Vast expense —— and in terms of capital you have to have immense amounts of capital to start, to do anything—— and a tendency towards ever-increasing violence, in the very production process. From which it follows that if we want to do this work, to incarnate a more humane, a more Christian, idea of carrying on, we would have to look in the opposite direction, and look not only with our eyes, but also with our hands.

Can't we make things small again? Reduce them to the human scale, get away from this giantism? Does it have to be so complex? Can't we revise our whole ideas and patterns of consumption in the direction of simplicity? I'm not saying 100%, because it's the direction that matters. Can't we use our brilliant technology to evolve methods of production to where even the little fellow can help himself and you don't have to be rich or powerful in order even to start? And, can't we go systematically and determinedly in the direction of non-violence rather than violence?

Only with the help of such knowledge and technology—— and it's not only hardware, it's also software—— can we serve a system that would serve man. Instead of the present system which enslaves him. Well of course this is said by me from a Christian point of view where serving man may mean something very different from the point of view of the purely materialistic civilization.

So first of all, back to the human scale. I have already given the arithmetical example of how with increasing numbers, the number of relationships increases exponentially. If you have a technology that is small, then that technology can use small sources of energy—— extremely relevant to the whole energy problem. You could heat this little building with solar energy, but you can't heat the Rockefeller Center with solar energy—— you couldn't even propel the lifts.

If you have a small scale technology of course all of your ecological problems disappear because nature has tolerance margins, and little skirmishes she can deal with it, but massive assaults that she can't deal with. If you have a small scale technology, and only if you have a small scale technology, can you get a better distribution of population. The fact that roughly 70% of the population of this country live in cities which between them cover just over 1% of the surface area of the country entails, of course, enormous energy usage. But it cannot be overcome with the existing technology, because it has been produced by the existing technology. So the precondition of any kind of decentralization of the population, smaller towns, a better distribution structure—— villages around the market centers, market centers around the major town, ideally no major town larger than a couple of hundred thousand or thereabouts. Anything more is an encumbrance and doesn't serve the human spirit at all. But it is no use talking about decentralization unless one incarnates this in the flesh and creates the wherewithal, the means of doing so. I would say it would also be very relevant to the problem of population explosion, because wherever communities have been small enough to where the mind can encompass it, they have behaved perfectly reasonably in matters of procreation.

Simplicity is a value in itself from a Christian point of view. We are here to do that just as much as is necessary to serve our real purpose. This excessive sophistication, complexity, specialization produces (as has been foreseen for 150 years) people so narrow-minded and so bothered that they have no time to become wise. Their life becomes a constant agitation and strain which crowds out the spirit. It was a great insight to me, when I've travelled from England via the United States to Burma, and I looked at it through the jaundiced eyes of an economist. It struck me that life in England is really very agreeable. The pace is not excessive. It's kindly. It's safe. I came to America, which I loved, but I was bothered by the nervous strain, the number of people on psychiatrists' couches, and so on. Then I came to Burma and there I found life as it really ought to be. Bags of time, great relaxation and happiness, the most joyous people you could possibly encounter. And then it struck me that the amount of time people have is in inverse proportion to the amount of labor-saving machinery they employ. This country is cluttered with labor-saving machinery and everybody lives under the most terrible pressure. England is sort of backward, and Burma has never embarked on this road.

The third item, namely capital cheapness, is of very profound political and sociological and psychological importance because if you have the possibility of making a living when you're not already rich, and creating something, then lots of people are admitted to the dinner table who today are progressively excluded. . . hence the unhappiness of the so-called developing countries. With this high technology they find that in spite of political independence they become more and more dependent because they are not already rich and powerful. They're caught. And they suffer immediate effects—— mass unemployment.

The final item, non-violence, of course is a value in itself from a Christian point of view, because Christianity tells us that we must learn that life is a school in which we must learn patience and forebearance, and that we will not practice it among ourselves if we don't practice it also in our relations to Mother Nature.

In Burma, before I was there, there was a British military station, about 20 or 30 miles away from a town, and in order to get mail to the people there, the British authorities hired an Indian chap with horse and coach, to bring the mail. They were prepared to pay him for this but not his entire cost, because the coach was suited to take passengers, and the road from this military station to the town was a very busy road with lots and lots of people walking, and oxcarts very slowly moving along.

This Indian plied his trade for over a year. When the year was out he came back and said, "I can't go on

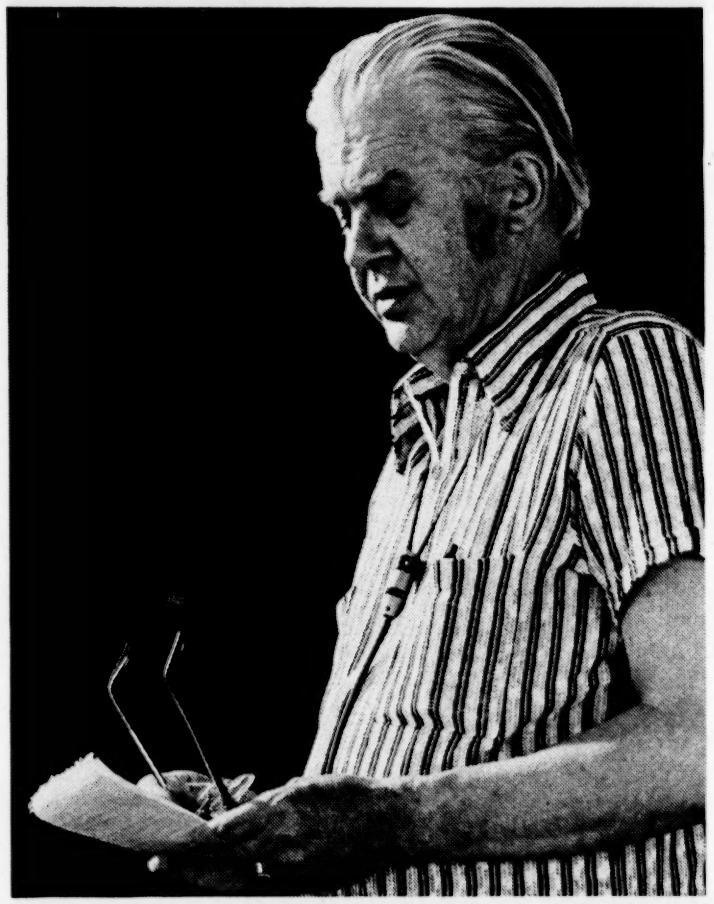
"The possibilities of any real change, not in the talking but in the doing, can only come from small groups of people."

doing it at that price." "Why not?" "Because I can't get any passengers." "Why can't you get passengers? The coach is convenient, plenty of people, price is perfectly reasonable, and they all have money. Well then, (probably someone had been to Harvard Business School), let's ask the consumer." And so they asked the consumer, these people who were walking 20 miles in the hot sun, "Why don't you use the coach? It only costs a couple of rupees." They said, "There, look at the horses. The horses shouldn't be pulling a coach, they should be out on grass. We would never demean ourselves to travel behind horses that are so ill-kept. We'd rather walk." Now that is man as the crown of creation, who cannot claim any dignity unless he realizes that *noblesse oblige*. And that, I found, was the universal attitude in this backward country, Burma.

If man is not the crown of creation, but merely a naked ape, then of course it's difficult to sell to him the idea of *noblesse oblige*. And he behaves accordingly. This non-violence is particularly needed in agriculture. And that I am saying to the converted, I'm quite sure. But it presupposes a far more decentralized way of doing this job because the most productive factor—— I think I helped to establish it as a concept in English discussion—— is the TLC factor, which when you really apply it is extremely productive. TLC means Tender Loving Care. The violence of modern medicine of course hardly needs to be mentioned. A clever chap said, "If an ancestor visited us today, what would he be more astonished at, the skill of our dentists, or the rottenness of our teeth?" Instead of tackling the problem which we know is a solvable problem, of letting children grow up with healthy teeth, we get this continuous escalation of greater and greater rottenness of the teeth, and greater and greater skill of dentists, so we always have reason to be immensely grateful for the existence of dentists who ought not to exist at all.

Now if you take all this together, then I would suggest that the possibilities of any real change, not in the talking but in the doing, can only come from small groups of people. So in a sense we don't really need a theory of decentralization. The dinosaurs will collapse under their own weight. But innovating minorities are always small and are ipso facto decentralized. If any one of us still expects any real help from big, powerful organizations, I suggest they are wasting their time. These organizations are big and powerful precisely because they are not, in this sense, innovative. So the best is to forget them. Or even better, if you are clever enough, to use them as milch cows.

The battle comes between two groups of people—— not the people who think there's no problem (they will also die away much too quickly), but the people whom I call the people of the forward stampede. Their slogan is "A breakthrough a day, keeps the crisis at bay." They resort to any degree of violence.



They launch Project Independence with a vast and horrifying nuclear program, no holds barred. They have, like the devil, all the most catchy tunes.

The others, I call them the Home-comers. They remember themselves. They remember what life is really about, and they do this kind of work that I've been trying to describe.

Sometimes—— more than sometimes—— I am accused either of optimism or of pessimism. Unfortunately, I don't know what's the case here. Most attacks that I am unduly optimist that anything can be done, I'm sorry to say, come from very young people. Other people say I'm a pessimist because I know something about the subject and therefore know it can't go on for any length of time.

Today the vocabulary is that anyone who calls black black is called a pessimist, and anyone who calls black white is called an optimist. But in the real sense what we need is optimistic pessimists. That's to say people who know. It's beyond argument if they know their onions, if they know any real facts. No one can argue with me as far as the pure situation is concerned. No one can really argue with an experienced ecologist as far as the ecological situation is concerned.

I'm an optimistic pessimist because I believe that there are now lots of things going on that make change possible. Materially it's no real problem. We can live on a small fraction of what we're living now, as the culture of poverty, wherever it has existed, has amply demonstrated. The great thing about the really optimistic pessimists is that they're not work-shy, and they don't stay at the level of talk-talk-talk, they actually get their hands dirty and do some work. Let's hope we can all graduate to that class. Thank you. ■

Schumacher's Buddhism

BY PETER GILLINGHAM

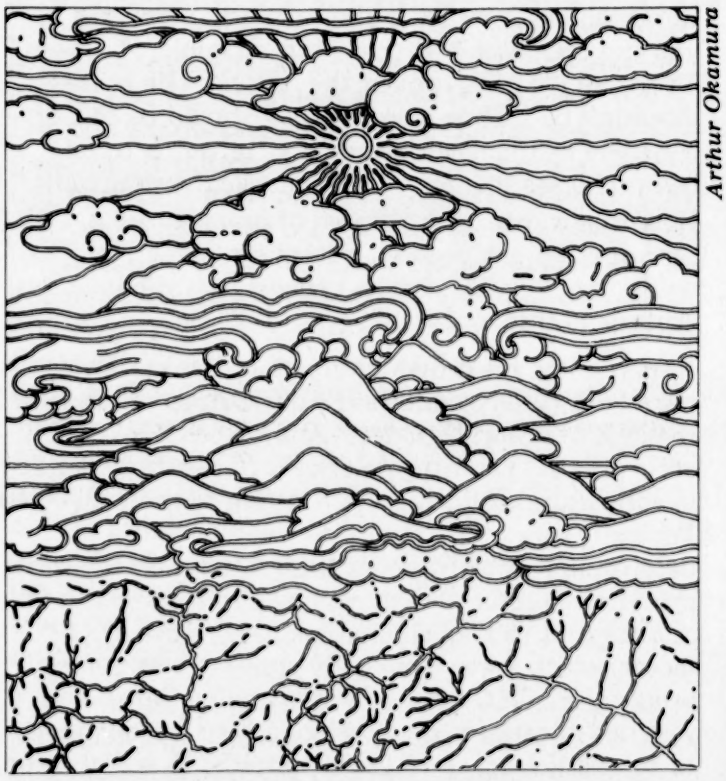
September, 1974: a young radio interviewer asks a question: "Mr. Schumacher, the thing that impressed me most about this book [**Small is Beautiful**] was that it represented a very unorthodox point of view concerning the whole experience that people have with material wealth and the production of material wealth. And what also struck me was the fact that you have this point of view and at the same time you have come out of a very orthodox background. You were a Rhodes Scholar in economics, and also head of planning of the British Coal Board. How was it that you reached some of the ideas you've had? Have you always had an unorthodox view, or did you after many years reach these kinds of conclusions?"

After five seconds of silence, the voice begins, the accent partly Oxonian-British "U," partly underlaid with Germanic coloration, at first very slowly, reflectively.

"After an upbringing which was basically a rationalist-scientific upbringing, there is still left a taste of ashes on one's lips. And it doesn't reach the questions that as a human being one is struggling with: Why are we here at all? What's the purpose of it all? So, I felt, — quite apart from my professional work, I felt it necessary to explore these matters. I took a lot of trouble and many years to study the whole of what is called 'philosophy.' Well, these different philosophers are extremely brilliant, fascinating; and when you have more or less digested what they have to say, the taste of ashes doesn't disappear from your lips.

"And so finally, after many experiments, also with psychical research, I happened to venture on a book on Buddhism. And that was what I was looking for. And I dropped all these other researches, psychical research ceased to be interesting to me. But in the literature of Buddhism I found repeated references to the existence of a school, a school that had been set up in Burma around the year 1900, from which a great revival of Buddhism had gone out throughout the Buddhist world. So, I thought — I must get to that school.

"Well . . . a family man, having migrated from Germany to England, having then spent four years in postwar Germany as economic adviser to the Control Commission — how can



Arthur Okamura

I uproot myself again and go to Burma? It was just not possible. But, things happen in a strange way: I got a request from the Burma Government to be economic adviser to the Prime Minister there. I had to haggle them down to a short stay, because I couldn't uproot myself. But I found the school, and I went under the tutelage of some Buddhist monks in Burma. And there, for the first time, I realized that it is not with the mind that you can get clarity but — what shall I say? — with the heart. But the heart will not speak to you unless you quieten yourself. And the Burmese monks taught me that. And once you achieve a certain degree of quiet, then suddenly things become clear to you which previously bothered you, and you see — they call it *vipassana*, and I don't claim to have attained *vipassana*, not by a long shot — but things as they really are, which the mind, which is the instrument of the basic intuition, cannot attain. It's the basic intuitions that must be right, and then the mind will work.

"Well then, the first result of such an experience is that you become very unhappy, and you come to your office and say, well, everything I do ceases to make sense. But then you have to reconnect that with 'life must go on,' with actual life work. And everything appears in a new light. And out of the struggles of ordinary life and various activities, various papers and lectures were written, and have been compiled into this book. They sound unorthodox to the orthodox, but they don't sound unorthodox in terms of actual human experience. And it's just too bad for theory, if it doesn't reflect actual human experience." ■

Peter Gillingham with Schumacher's assistance is busy organizing a U.S. equivalent of the Intermediate Technology Development Group in England (EPILOG, P. 534). He is working with Dick Raymond and Portola Institute, where we began the WHOLE EARTH CATALOG seven years ago. (That long. Migod.) The organization, Intermediate Technology, has two prime objectives: "To put before the American people the ideas of E.F. Schumacher and their practical applications and consequences for the future; to assist those who are putting these and related ideas into action, both in our own society and elsewhere in the world."

Their address: Intermediate Technology, Drawer I.T., Los Altos CA 94022.

—SB

Systems, Economics, & "Female"

BY HAZEL HENDERSON

I'm jamming this into the magazine, somewhat at the last moment, because it braids elegantly so many of the various ideas the CQ *has been espousing:*

- *Cartesian male-type rationality has run amok with our values.*
- *We engage in the "fallacy of misplaced concreteness."*
- *A system manages a system.*
- *"Economics has become a substitute for thought."*
- *To the extent that we use "energy slaves" we become energy slaves.*
- *Morality is long-term pragmatism.*

This talk was for many the climax of the World Future Society meeting in Washington D.C. this June, 2700 people attending. The grossly male-dominated panels inspired a Women's Caucus, who chose Hazel Henderson to speak their piece.

Hazel is co-director of the Princeton Center for Alternative Futures, with her husband Carter (see p. 130).

—SB

I feel a deep responsibility at this moment, because any one of the women in this hall could as well make this statement. I must therefore pay tribute to the Womens Caucus and especially to Wilma Scott Heide, without whose efforts and courage, these issues would not have been raised and I would not have been here. I agree with my friend, Lester Brown, that indeed, the womens' revolution is the most profound and the least studied phenomenon of our time.

The title of this Plenary Session is "Strategies for Achieving a Desirable Future." I find the word "strategies" an uncomfortable one. Not that I am not happy that many futurists are now working on such strategies and scenarios. But I have humbler goals. They are to open up processes and decision-mechanisms to learning and to increase possibilities for desirable change; and to expose underlying values and assumptions buried deeply and inaccessibly in all our so-called "value-free" methodologies, technologies and even sciences. Science has become a religion – while ethical and normative studies languish behind the walls of academe, or survive furtively in our organizations and bureaucracies in the hearts of their participants. Values and insights are driven into hiding by our culture's insane commitment to objectification, to linear, reductionist, inductive, rationalistic, quantitative, logical, positivist forms of cognition – the whole Cartesian trip.

Brain researcher Robert Ornstein has noted that linear models of cognition are located in the left hemisphere of the brain.[1] Meanwhile the right brain hemisphere processes data simultaneously, using spatially-aware modes of cognition, the intuitive, imaginative, deductive thought-processes, such as those insights which create the great hypotheses of science, that recognize new patterns and fields, and that "body wisdom" which senses that there are no real boundaries between self, society and ecosystem. We in this culture have privatized this form of cognition, which seems to embarrass us, and designated it "female." In our pursuit of knowledge and hopefully, wisdom, both forms of cognition are necessary, operating in synchronization: the daring intuitive leap to hypothesis and the equally important process of careful, empirical validation or rejection. The understanding and appreciation of the role of values is a right brain, intuitive process however, and because it is difficult to incorporate value considerations into Cartesian, reductionist schemes and models, such questions are sidestepped in the sterile search for "rigor" or only grudgingly acknowledged. *And yet values, far from being peripheral concerns, are in fact, dominant, driving variables in all human systems, whether technological or social.*

Today we see our culture suffering from an overdose of left-brain hemisphere Cartesian cognition. It has led to compulsive dichotomizing and the Tower of Babel of academic disciplines that now fractionate reality. Accordingly we reward analysis and punish synthesis, while the interesting problems exist at the interfaces between the disciplines. Similarly, our organizations are narrow and often single-purposed, whether corporations, government agencies or committees of the Congress. In fact, organizations are devices for screening out, impounding or distorting information, so as to better pursue their internal goals. This has led to our multiple crises of suboptimization and the generation of sharply-mounting social and environmental costs which economists call in almost a Freudian slip "externalities." The new citizens' movements for consumer and environmental protection, racial and sexual equality, social and economic justice have organized around these social costs now welling up at all the interfaces: the dis-economies, dis-services and disamenities produced by such narrow cultural perceptions.[2]

Luckily, these many dichotomies are now becoming increasingly visible and some are breaking down. We see that such arbitrary divisions as those between the public and the private sector no longer work. They have led to the anomalies we see today where we can "afford" to produce hundreds of different brands of dubious patent medicines, aerosol cans, pet foods and plastic novelties, but cannot "afford" police or fire protection, sanitation, or enough teachers, nurses, or parks and clean air and water. Other unreal dichotomies are those between property rights and amenity rights, with which they often conflict. We see that we have over-rewarded competition while ignoring the equally important role of cooperation in maintaining the viability of our social system. The Social Darwinists looked at nature and saw only the surface competition, while overlooking the much more subtle and pervasive cooperation which characterizes all natural eco-systems. These cooperative functions which maintain the cohesion of the society and permit a context for competition: cleaning up the mess caused by production, caring for the casualties and dropouts of the competition and shouldering the opportunity costs of caring for the young have been left to women, and are not even counted in the Gross National Product.[3]

But public debates are still confused by what Alfred North Whitehead called "the fallacy of mis-placed concreteness." Economists, statisticians, program and budget analysts have almost succeeded in masking social and moral issues as pseudo-technical or economic choices or mere questions of "efficiency." This begs the question, "Efficiency for whom and in relation to what?" "Efficiency" is a meaningless word unless it is qualified by time and space coordinates. In other words, one must specify what system or sub-system is to be made optimally efficient over what time frame. Similarly, such words as "productivity," "profit" and "maximizing" are equally meaningless unless we are told

what is to be maximized: the corporation, the society, the municipality, and over what time period. Now such empty words as these are clearly exposed as normative and value-laden.

Similarly, dangerous self-delusions are evident in such terms we use as that of "modeling" or "managing" the system. The insight of the great operations researcher, Stafford Beer, leads us to understand that *only the system can model the system* and *only the system can manage the system*. Evolutionist Gregory Bateson puts it another way, "Systems are immanent information."[4] To even conceive of "managing" a system is a distortion. Feedback from the apparently lowliest most peripheral part of the system is an integral part of management of the system. Each bit of information feedback is as much a manager of the system as the more apparent decision-nodes. So perhaps it would be healthy and cathartic if more of our decision-makers at the center would admit to themselves what we citizens already know: they cannot even model the complex systems we have created – let alone manage them. This does not mean that we do not have to go on making models in order to help us learn about systems, but that we should not become hypnotized by them and come to believe in them. The danger is that too often, such models do not mirror reality as much as they mirror the mind of the modeller.

There now exists in this country an intuitive understanding of all this, while the "externalities" can no longer be dismissed because they have now reached above our sensory threshholds: we can see the dirty air, smell the automobile exhausts, hear the noise levels rising and sense the social dislocation around us. The new social movements for peace, a humane world order, social justice and ecological sanity are now determined to get in on defining the questions. That's what public participation is all about. Citizens now understand that professionals with narrow, specialist training in the sterile, quantitative methods that women, luckily, often escaped, cannot adequately define our problems. Not that professionals are not essential to the debate, but that they must now be able to see where the limits of their technical competence end, and where their values carry no more weight than those of any other citizen in a democracy. For example, let us examine the importance of these definitional questions and the values underlying them and their culture-specificity. In some cultures:

- Transportation is viewed as a measure of dysfunction in the social and living arrangements.
- Labor is viewed as an output of production, as in the Buddhist concept of work and "right livelihood" as the path to human self-actualization and satisfaction.[5]

Similarly, terming our current multiple crises of sub-optimization as "inflation" compounds confusion. Firstly, defining the problem as an "economic" one results in its monopolization by economists, who then in turn, as a result of their prior conditioning, mentally lock onto the Phillips Curve explanation of inflation, thus short-circuiting all further useful speculation on the problem. Indeed, any citizen who watched President Ford's inflation summit now knows that economics has become a substitute for thought. In fact the "inflation" summit, could as fruitfully have gathered political scientists, biologists, psychologists or physicists to discuss the problem, rather than economists. With all the new discussion of economic planning, we must always bear in mind that there is no such thing as "economic" planning, there is only social planning. This may be one of the reasons that the Employment Act of 1946 fell short of our expectations. It set up a Council of Economic Advisors, rather than a council of social advisors, and focused on narrow economic models which permitted our social costs to get out of hand to the point that it is these social costs that are rising exponentially, rather than the Gross National Product, as I have described elsewhere.[6]

We are finally perceiving that taxonomy can also become an enemy of thought. My goal is to open up such definitional issues and debates in two vital areas: science policy and economic policy. "Science," as Harvey Wheeler has put it, "has become society's legislature," and my goal is to open up that legislature to democratic participation by the groups impacted by technological decisions. When the goals of knowledge are power, science becomes the servant of the powerful. Science is not neutral, nor is technology, indeed they are driven by value-systems. We must now ask to what extent big-bang, capital-intensive technology concentrates power, wealth and knowledge in fewer and fewer hands, at the expense of making the rest of us more powerless, alienated, poor and dependent, while increasing aggregate human ignorance. For example, do Americans use "energy slaves," or have they themselves become energy slaves? Groups impacted by these technological decisions: consumers, the poor, labor, women and other minorities, as well as the advocates of environmental values and the rights of future generations must now take their place in the new legislature of science policy and enter the debates that take place there behind closed doors on risk-analysis, and evaluation of costs and benefits and how they are to be distributed, since these matters concern values and priorities. I will define "impacted groups" as all those organized and unorganized citizens, taxpayers, consumers and workers, minorities and poor people who do not function primarily as instigators of technological change, nor have significant financial or intellectual investments in the promotion of specific technologies: in other words, the involuntary consumers of technological changes, as opposed to its producers. The representatives of all these involuntary consumers of technology and the huge constituencies involved, must now sit on all specialist panels and advisory committees in our science-policy making bodies. They represent also the variables that so often fall down between the stools even in inter-disciplinary panels and committees. Only when such surrogates for these variables, clothed in human form, sit down at these meeting tables, can the specialists deal with them experientially rather than intellectualizing about them.[7] I have, with the help of many friends, advanced some of these concepts and methods at the Office of Technology Assessment, and as you have heard from Senator Kennedy, they are working, and in many cases, have improved the quality of the research and broadened the range of alternative options and impacts presented to the Congress for debate: the desired goal of all well-performed technology assessments. Public participation is not a manipulative bureaucratic device to make people feel "involved," it is a method of improving the definition of the study and the subsequent research. Certainly, some contractors find it unfamiliar and messy – but we are in a mess already, aren't we?

Turning to the need to expose the normative nature of economics, which still often parades as a "value-free" science, I propose that we expand the Council of Economic Advisors from its present three members to seven, so as to include a consumer economist, a labor economist, a welfare economist supported by minority and social and economic justice constituencies, and an environmental economist. I would also propose that we consider opening up the membership of the Board of Governors of the Federal Reserve Board in the same way. Such a step might serve an educational purpose for all our citizens: to illuminate the fact that there is no such thing as economics, there is only politics, a verity pointed out by the great economist John Stuart Mill in his **Principles of Political Economy** in 1848.

Opening up economic and science policy-making to feedback is only good cybernetics. In addition, let's keep futurism open, as the Womens Caucus here has attempted. Let us not replay the compulsive search for sterile algorithms, mathematical schema or premature formulation, professionalization and accreditation. Just as I'm suspicious of any contractor who asserts expertise in performing technology assessments, so we should look askance at those who claim that they know how to do futures research. The driving value variables implicit in both of these new forms of research will assure that they can never claim value-free objectivity, but will always involve essentially political concerns of social choice and conflict-resolution. Let us also open up bureaucracies, by working together, those of us on the inside with those, like myself, who are on the outside of corporations, agencies and other large organizations and the academic institutions. Let us open up corporate decision-making, expand their boards of directors to greater diversity, perhaps after the

German model of two-tier boards, one of business-oriented and managerial people and one composed of the representatives of the corporation's major constituencies, so that we can proceed to acknowledge the social and political role of our largest corporations and move from the concept of allegiance to stockholders to a wider view now accepted by many corporate managers, of allegiance to "stakeholders."[8]

Multi-national corporations must now be viewed as major actors on the world stage. In my travels in Third World countries, I have too often been taken by government officials and local consumer groups on painful tours of corporate irresponsibility. It has been a very radicalizing experience for me. It has made me wonder whether there is any such thing as "profit" without some equal and unrecorded debit entry in some social or environmental ledger, waiting to come back and haunt us. Perhaps in the short-run and at small scales, there is; but as two great economists, Kenneth Boulding and Nicholas Georguscu-Roegen know, as we approach the newly-perceived boundary conditions and the constraints of the laws of physics, "profits" become a figment of human imagination.[9]

These Third World people I have met say to me, "You are lucky, you can do something to help us because you live in the heart of the beast," (as the United States is often called). But I answer, "The beast is not all evil. Many people who live there are yearning for change, wholeness, integration, synthesis of male-female, body-mind, head and heart and all the other dichotomies that rend us apart. Many of them are working to right the wrongs, people in the movements for corporate accountability, for social and economic justice, for racial and sexual equality, for liberatory, appropriate, human technology, for reform of our destructive mass-media and an end to Western and Euro-centric cultural domination – a new system of values and ethics whereby we can make peace with each other and nature.

Many of these yearning for such changes are here at this gathering, exploring these concerns and increasing their own self-knowledge; trying to understand what I call the Kilroy Was Here Syndrome.[10] Sigmund Freud, Norman O. Brown in **Life Against Death** and Ernest Becker in **Denial of Death** have all emphasized that we are the only animals on this planet cursed and blessed with self-awareness and the knowledge that we are going to die. In trying to avoid confrontation with death, meaninglessness and nothingness, we all try to write our own versions of "Kilroy Was Here" on each other, on events and on our surroundings. Such motivations may be basic to our condition, but at least we can unhook them from their more destructive forms of expression as competition and seeking power, identity and material display at the expense of others and our life-support system.

Indeed, we are now learning that self-interest, if seen in a large enough time/space context, is now identical with group-interest, societal-interest and species-interest. My personal commitment, which I know most of us share, is to do what we can, to work wherever we are, in whatever institutions we find ourselves enmeshed, to seek out others and continue on the path to expanded awareness and the cultural mutation that now must come. For we now know that for the first time in our history, the teachings of all our great spiritual leaders (who have always been the real futurists): the Golden Rule, the edict to serve the people, the values of love, caring, sharing and tolerance – morality, in fact, has now become pragmatic. ■

NOTES

1. Robert Ornstein, The Psychology of Consciousness, Viking Press, 1972.
2. The Annals of the American Academy of Political and Social Science, March, 1974, pp. 34-43, Hazel Henderson, Information and the New Movements for Citizen Participation.
3. Harvard Business Review, Ecologists versus Economists, Hazel Henderson, July - August, 1973.
4. See for example: Gregory Bateson, Steps to an Ecology of Mind, New York, Ballantine Books, 1973.
5. E. F. Schumacher, Small is Beautiful, Harper Torchbook, 1974.
6. Planning Review, The Entropy State, Hazel Henderson, April/May, 1974.
7. Public Administration Review, Re-Examining the Goals of Knowledge, Hazel Henderson, Jan-Feb, 1975.
8. For a discussion of this and other issues of corporate accountability, see Harvard Business Review, Towards Managing Social Conflict, Hazel Henderson, May-June 1971.
9. Nicholas Georgescu-Roegen, The Entropy Law and the Economic Process, Harvard University Press, Cambridge, 1971.
10. The Futurist, The Decline of Jonesism, Hazel Henderson, October, 1974.

Ocean Maps

We sometimes forget that land does not stop at the water's edge. Off the coast of Argentina, the continent remains within 500 feet of the surface for over 1,000 miles. On the other hand, off the coast of Peru, an 11,000 foot trench nuzzles the coastline. The great explorers of the twentieth century have been the oceanographers and their equipment. Their maps and collections have confirmed the theory of floating continents, exposed mountain ranges taller than the Himalayas, located the last great caches of natural resources and made me feel even more reverent toward this birth-place of life. These maps are natural mandalas of whole Earth consciousness. They are cheap, accurate, and beautiful.

–Peter Warshall

Ocean Maps
Arctic; Atlantic;
Indian; Pacific
$2.00 each
from:
National Geographic
Society
Washington, DC 20036

Response to Sagan's Conjecture

We printed in the Summer '75 **CQ** *this apparent reconciliation between Morowitz' statement, "The flow of energy through a system acts to organize that system," and Margalef's statement "Pumping more energy in and out of a system simplifies it" (i.e., disorders it):*

SAGAN'S CONJECTURE

"If the energy-per-pulse flowing through and interacting with a system is greater than the binding energy of the least strongly bound component of the system, then there will be a net loss of order in the system.

Conversely, if the pulse energy is less than that of the weakest bond, there will be a net gain of order in the system."

Some letters:

First, Sagan's Conjecture struck me as being a nice description of developmental stress — that kind which slows growth in developing organisms, like children. Most of my work in the last five years has been with brain damaged children, all of whom are very sensitive to certain kinds of stress. As Charlie Muir points out, development occurs along a line of stress that cannot be crossed over without stagnation or regression (breakdown of structural components).

One thing that occured to me was that this conjecture reduces the confusion surrounding anxiety in the psych literature, by differentiating between energy input that mobilizes learning capability (a "little" anxiety), integrates interpretive structures and focuses attention, and energy input that disrupts learning by narrowing focus and dropping behavior to lower, more stable levels (short term stress reaction). The effect of a short term stress reaction is always to reduce input.

However, the conjecture is probably too simple to be useful without some qualification, as noted by a couple of your critics. Bateson's comment was very apt, but incomplete. The introduction of a spy assertion into a group causes greater disruption than would be handled elegantly by Sagan's conjecture because of the structural qualities of patterns or richly connected systems in Ashby's phrase, which can have their equilibrium severely manhandled by certain disrupting influences even though the actual energy value of the disruption is small, since change in one component changes all. (Whew). Bateson's criticism, it seems to me, applies to all non-relative information theorizing. That is, all communication between two systems or between an environment and a system implies some form of redundancy that can be characterized as a similarity of premises, an interlock of communication devices, or what have you. In fact, it seems to me that things like the negentropic formula or ideas similar to Sagan's conjecture will hold true only within a framework and we can use them in analysis only if we can define the framework. This is forgotten when something like Sagan's conjecture is left out in the middle of the field.

Also, on the question of binding energy: Maintenance energy might be a better term, since any structured system loses binding energy over time unless certain types of energy are introduced to compensate. Note the step structure of human metabolism that allows carbohydrates to be converted into proteins. Looked at in this way, and with due account for the location of the structure we are looking at hierarchically we can see three different energy levels appropriate to a given framework:

1) maintenance energy levels
2) growth energy levels
3) stress energy levels

with the quantity of energy (within this framework, remember) increasing as you go down the scale.

—Norman DeLisle
E. Lansing, Michigan

Re Sagan's Conjecture:

When we are talking about cybernetics and ecology, we view the world as a collection of discrete, quasi-conscious entities, themselves subject to cybernetic analysis, arrayed in feedback loops which "contain energy," in that the loops tend to persist or else dissolve explosively. From where I sit, the use of the term "energy" seems to generate some confusion.

"Energy," in the physical sciences, is the ability to do work, eg, the ability to apply a force to a mass over a distance. The total amount of energy available in the universe to do work is entropy, which of course always declines with time in thermodynamic equations.

"Information," Margalef says very interestingly, is the ability to affect the future. (This definition is interesting because it takes a point of view inside the system.) This idea is very close to the ability to do work (or cause work to be done) but information is not conservative, and there is no reason to expect the total quantity available to decline with time, lord knows.

In this foggy midlands where we actually find ourselves, any system we encounter will have qualities of a physical system and qualities of an information system; a true dual nature, like light is a wave & light is a particle.

Sagan's conjecture is based in the physical end; so we have like a crystal growing in a fluid that requires a certain amount of energy to circulate the fluid, but too much energy will de-structure the crystal. In this environment the conjecture is obviously valid.

When we move into actual systems (such as ecosystems), be they ever so straightforward, the conjecture becomes more complex. It is no longer clear even what an input pulse is. If we attempt to quantify the unitary input stream, looking forward to "comparing" that quantity with another quantity, "binding energy," we would presumably derive some array of expressions which could be sampled at various times. From where I sit, it is not clear at the present time whether such an approach is theoretically valid (that is, whether one could in general construct an array which contains all significant information.) Current thinking seems to be that we can, or will soon be able to, construct "engineering" models which approach reality on some given set of practical results, but nobody has done it yet (except to build up astrological tables, which are useful to mariners.). At any rate we have already lost the concept of the system interacting with its environment.

Attempting to construct a quantified array for "binding energy" we meet further difficulties. When we have a statistical collection of organic molecules, we can speak about the average pulse size needed to break down a given fraction of them. In actual systems, damage does not occur so much as it propagates. Purely local "damage" which does not spread probably represents an energy trap for the system. In physical terms we can say whether a reaction is exothermic, meaning that a lump of the stuff once set on fire will continue to burn, giving off heat, until it runs out of something; or endothermic, meaning it will burn only where and so long as heat is applied to it. The mechanism by which these effects predictably occur involves consistent units of energy, like BTU's, which are now in one form and now in another, but always conserved.

What we would like to ask is, in a practical system, under what conditions is an input pulse liable to ignite an exothermic reaction in the system which will lead to a "loss of order." Loss of order perhaps means the extinction of some non-redundant element of the system or perhaps means that cost-to-replace exceeds available surplus production. In an ideal chemical universe, these questions have well-defined answers.

In the realm of pure information, we have Margalef's universe of pure energy with no past. Ideas come as if *ex nihilo*, Athena sprung full-blown from the head of Zeus, and are as soon extinguished. We have a "unit of information" the bit, but the value of a bit notoriously depends on its position, and bits are certainly not conserved. The information which is "radiated" when an information system decomposes is not a function of the information which was required to build up the system, and it is liable to be quite different in kind from the pulse which ignited the decomposition.

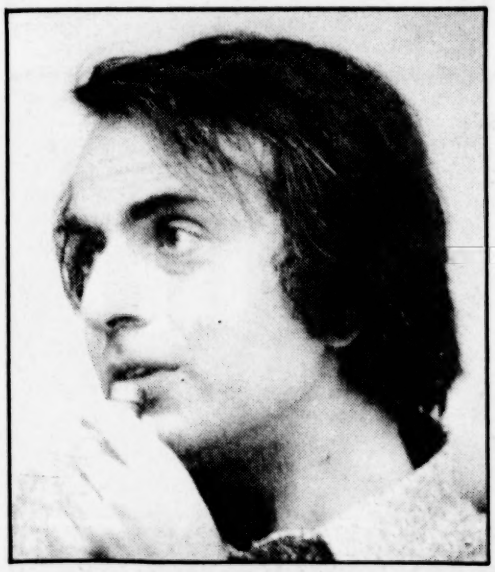
In the real world, contending with systems which are both physical systems and information systems, it is an absurd task to speak of the stability of a system in the face of hell knows what. We can perhaps speak of the resiliancy of the system with respect to some input pulse or category of pulses.

Of course even this limited kind of a quantity is dependent on the state of the system; the resiliency varies with time. And since actual systems go through all kinds of cyclic variations, the system is liable to be particularly vulnerable to cyclic pulses, or variations in pulse repetition rates. So it may be misleading to speak of a single pulse.

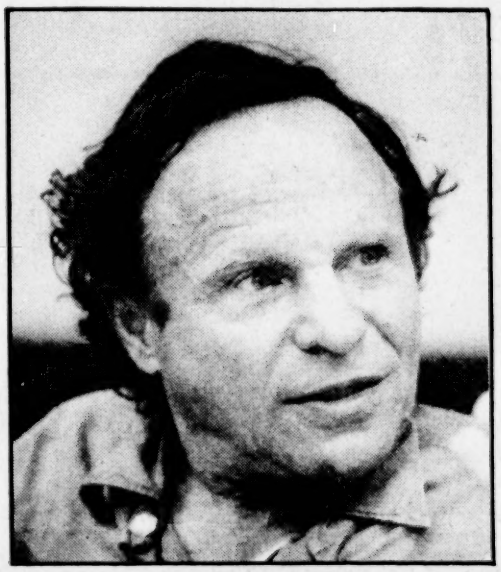
Looking now at the converse conjecture, one first wishes to note that if energy input is zero, entropy will increase and the physical system will run down. So for completeness, the conjecture needs to have some kind of lower limit to energy input for good health.

But there is a more fundamental problem. Keying off Margalef, "gain of order" seems to mean "gain of maturity," so then the converse proposition becomes, if a system is fed less than a disastrous amount, it will get more mature. True enough, but evolution is a superior type of gain of order, necessary for the continuation of all life. (In fact, evolution is necessary *a priori* to build up the actual system.) And evolution requires change, requires that all systems be liable to catastrophic shocks. So continuing gain of order in our ecology in a paleontological time frame requires that there be no limit to the size of an input pulse. Reality is hard. So I guess the best we can do is describe some pulse size distribution that facilitates gain of order. I imagine that there would be a relatively constant noise level with shocks which decreased in frequency with magnitude.

—Marshall Tabor Pease
Chesterton, Indiana



Carl Sagan



Philip Morrison

Lynn Margulis

Viking & Sagan's nightmare

This particular vision concerns Viking, a vehicle which recently left Florida enroute to Mars with the intention of landing there in July 1976 and looking around for life. Exobiologist Carl Sagan helped design the life-testing experiments on the craft.

The lander has no lights, flashbulbs, or infra-red cameras. Sagan's nightmare is that Mars turns out to be teeming with life, all of it nocturnal.

His friend Anne Norcia drew up the conjecture in detail.

Carl invited me to Cape Canaveral for the launch this July, so I've been sucked into the suspense with the others. There probably won't be life — Mars is too cold and too dry — but what if there IS?

New ball game. As Philip Morrison put it, "Then life is no longer a miracle. Life is a statistic." Then, for sure, the universe is alive.

Morrison also grumped about the instrumentation on Viking. It has no microphone. We will not hear the tearing howling winds of the Martian surface.

Lynn Margulis (co-author of "The Gaia Hypothesis," Summer '75 CQ) made three interesting statements at the launch. 1) She showed that some forms of Earth life — exotic slime creatures and others — would be undetectable by Viking; 2) she shared widespread misgivings that Viking's life tests are too hot and rich for Martian habits; 3) she extended the Gaia Hypothesis to predict no life on Mars — the Martian atmosphere displays a chemical equilibrium completely unlike Earth's lively imbalances.

Lynn Margulis, Philip Morrison and wife Phyllis, Carl Sagan and Linda, Jerry Soffen the Viking Project scientist — these are very nice people. That is my abiding impression from the Viking launch.

—SB

After a several year surge of gardening and farming books, the good ones are finally coming.

–Rosemary Menninger & Richard Nilsen

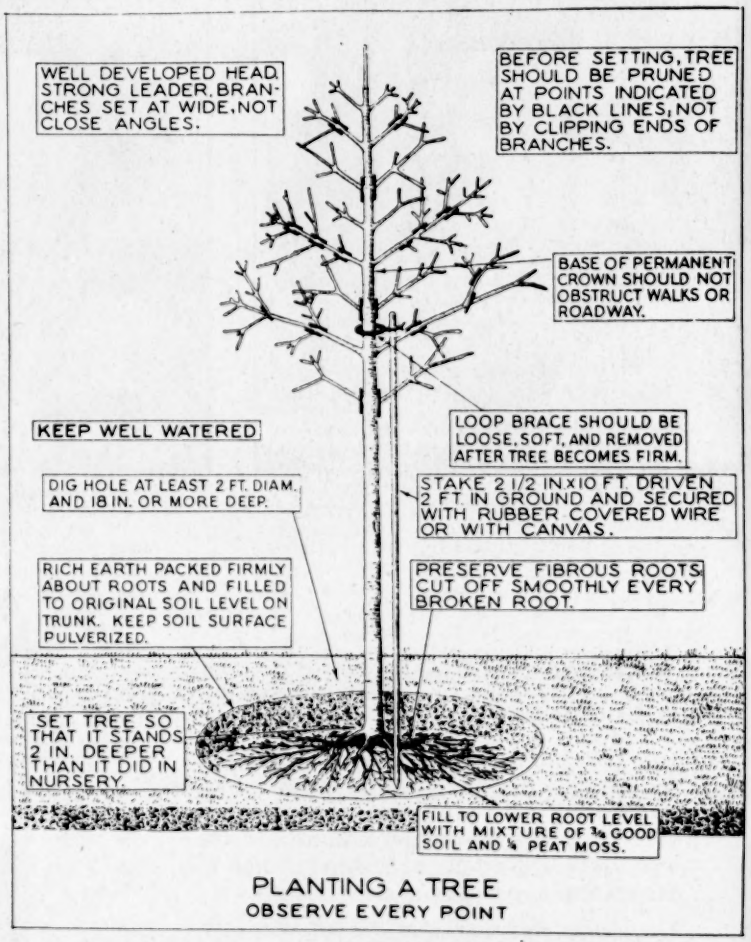
Plant a Tree

Johnny Appleseed realized that planting trees is political; the Datsun company realized that planting a tree for each test drive would sell cars. This book could create a tree planting movement, simply by being such a good manual. It describes, state by state, city street tree planting programs; urban tree maintenance and the brand new practice of controlling street tree pests by releasing predator insects. There is equal discussion of planting and maintenance for various rural conditions, and a fine encyclopedia of many American, European and Oriental trees, with beautiful black and white photographs. These pictures for me are like fairy tales, recalling visions of trees in my childhood.

–Rosemary Menninger

Plant a Tree
(A Working Guide to Regreening America)
Michael Weiner
1975; 277pp.
$6.95 postpaid
from:
Macmillan Pub. Co., Inc.
Order Department
Front and Brown Streets
Riverside, NJ 08075
or Whole Earth

GOLDENRAIN TREE, Koelreuteria paniculata; grows well in wide range of soils; hardy to wind, frost and drought; grows up to 4,000 feet elevation. One of the best small flowering trees for lawn and street planting because of wide tolerance of soil types. Unusually hardy under tough city conditions.


WELL DEVELOPED HEAD. STRONG LEADER. BRANCHES SET AT WIDE, NOT CLOSE ANGLES.
BEFORE SETTING, TREE SHOULD BE PRUNED AT POINTS INDICATED BY BLACK LINES, NOT BY CLIPPING ENDS OF BRANCHES.
BASE OF PERMANENT CROWN SHOULD NOT OBSTRUCT WALKS OR ROADWAY.
KEEP WELL WATERED
LOOP BRACE SHOULD BE LOOSE, SOFT, AND REMOVED AFTER TREE BECOMES FIRM.
DIG HOLE AT LEAST 2 FT. DIAM. AND 18 IN. OR MORE DEEP.
STAKE 2 1/2 IN X 10 FT. DRIVEN 2 FT. IN GROUND AND SECURED WITH RUBBER COVERED WIRE OR WITH CANVAS.
RICH EARTH PACKED FIRMLY ABOUT ROOTS AND FILLED TO ORIGINAL SOIL LEVEL ON TRUNK. KEEP SOIL SURFACE PULVERIZED.
PRESERVE FIBROUS ROOTS. CUT OFF SMOOTHLY EVERY BROKEN ROOT.
SET TREE SO THAT IT STANDS 2 IN. DEEPER THAN IT DID IN NURSERY.
FILL TO LOWER ROOT LEVEL WITH MIXTURE OF 3/4 GOOD SOIL AND 1/4 PEAT MOSS.
PLANTING A TREE
OBSERVE EVERY POINT

Judge William J. Wright, of Palmdale, California, gives offenders who commit minor misdemeanors a choice: pay a fine, go to jail, or plant some trees! Those individuals who breach fish and game laws, vandalize or letter trees in the forest, or are too poor to pay a fine or wish to avoid a jail sentence to circumvent losing status in "security-type positions" and thus their job are allowed to work in the national forest as an alternative.

According to one district forest ranger, the "court crew" works "beautifully." These people are not put on "make-work" details but on specific projects including the planting of trees.

•

Key Questions Important to the Survival of the Tree

1. Can the tree survive the minimum temperature of your locale for prolonged periods of time?
2. Can the tree tolerate the fumes, dust, smoke, and road salt it may be subject to?
3. Will it be able to thrive in the soil it is planted in?
4. Is the rainfall adequate for optimum growth, or will watering be required?
5. How resistant is the tree to diseases common to the area?

•

Multiple-row windbreaks are often planted as follows: a row of conifers to deflect the wind upward, a row of deciduous or broad-leafed trees to trap whatever wind breaks through the conifers, and a third row of conifers to carry upward any remnants of a powerful blow that manages to break through.

While each windbreak environment favors the growth of different species, spacing is generally consistent in all locales. Conifers need 8 to 12 feet between themselves, while broad-leafed trees must be between 8 to 18 feet apart. The space *between* each row of trees, in a multiple-row windbreak, should range from 10 to 20 feet wide. This allows farm machinery to pass between the rows of trees to suppress weeds and grass from growing until the tree canopies are large enough to block the sunlight and inhibit competitive plants in a natural way.

The Garden

[more →]

DRY CL ERS

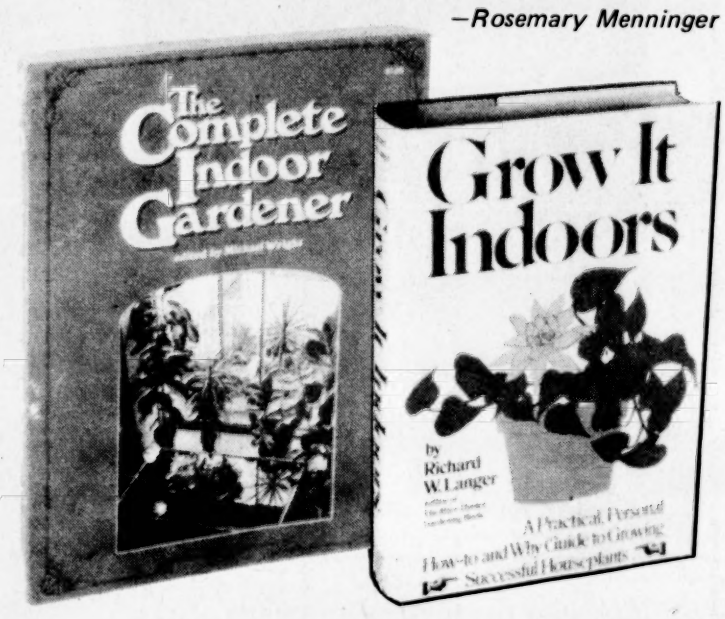
[more →]

THE END

The Complete Indoor Gardener & Grow It Indoors

Although unaffiliated, these two books together comprise the best source of houseplant information so far. **Complete** *could be the workbook and Langer's book the text.* **Complete** *has several useful color pictures per page and excellent isntructions. If I had to buy one, I'd buy that. Langer goes deep into indoor gardening technique, and horticulturally, it's even better than his homesteading book* **Grow It!** *(EPILOG, p. 494).*

—Rosemary Menninger


The Complete Indoor Gardener
Grow It Indoors
by Richard W. Langer
A Practical Personal How-to and Why Guide to Growing Successful Houseplants

The Complete Indoor Gardener
Edited by Michael Wright
1974; 246pp.
$7.95 postpaid
from:
Random House, Inc.
457 Hahn Road
Westminster, MD 21157
or Whole Earth

Grow It Indoors
Richard W. Langer
1975; 243 pp.
$9.95 postpaid
from:
The Saturday Review Press
c/o E.P. Dutton Co.
201 Park Ave., So.
New York, NY 10003
or Whole Earth

After my misfortune with Gro-Lux, I switched to Naturescent tubes, manufactured by Duro-Lite Originally called Optima, these tubes were developed to approximate natural light for use in the color-finicky textile industry. They not only produce a natural light, but come with a one-year guarantee, which I find comforting. As for results, my plants with their tops four to six inches below the tubes are all thriving. On the whole, growing tops can be no more than ten inches from the bulbs if you expect your plants to do well under fluorescent lights.

—Grow It Indoors

•

Watering cans; sprayers
A watering can is a vital piece of equipment. For watering pot-plants and window boxes, choose one with a fine nozzle and long spout **right below**. It is wise to have two sprayers **right** – one for water and the other for pesticides. There are neat hand models suitable for treating plants indoors in confined spaces. The sprayer used for clean water should be clearly marked and used for nothing else. Many plants benefit from an occasional fine overhead spray, especially in the dry atmosphere of the home.

—The Complete Indoor Gardener

Ginger; coffee
If you can find a fresh ginger root in a food shop, you can grow it into an extremely handsome indoor foliage plant, with glossy dark green leaves. **below** Simply suspend the root in water until it sprouts, and then plant in a pot of good potting mixture. Keep it warm and light.

Ginger

You can also grow a plant from a fresh unroasted coffee bean. It needs warm, damp potting mixture to germinate, but once you have a coffee plant it likes only moderately warm conditions – a minimum of 10°C (50°F) – and prefers shade and plenty of air. The leaves are a coppery colour when they first emerge, and turn a dark, glossy green. The small white flowers smell sweet, and are followed by red berries that contain coffee beans. Once mature, prune the bush to keep it neat for the house.

Coffee

—The Complete Indoor Gardener

•

Recently while perusing the English version of the May 1973 **Doklady Akademii Nauk SSSR**, an obscure Russian scientific journal, I came across a fascinating little article still somewhat out of science fiction. Somewhere in their vast bureaucracy the Russians must have plans to colonize the moon, for here were described the beginnings of research on how to feed the emigrants.

The article, "Growth and Development of Plants with a Lunar Period," discussed the fact that most annual plants, if they even survived being subjected to a period of darkness lasting three or more days, lost not only their photosynthetic pigments, but their reproductive ability as well. Cereals were particularly sensitive to the light deprivation, a two- to three-day period of darkness being sufficient to eliminate development of the grain for which the plants were grown.

The phenomenon would present quite an agricultural problem on the moon, where the days and nights are each fifteen earth days long. Artificial lighting could be used to grow the plants, of course, but the energy demands and cost would be tremendous.

Scientists reasoned, however, that sharply reduced night temperatures might slow down the plant's metabolic rate enough to avoid the disastrous damage to the reproductive system. It worked. So far as lunar wheat harvests went, the particular problems of extra long nights, at least, had been solved.

What I found just as interesting, from a houseplant point of view, was that plants used in the experiment made up for lost time during the fifteen-day days. Overall the wheat plants grown on a lunar time-table matured as quickly as their more normal earth-environed cousins.

—Grow It Indoors

Pasture and Range Plants

If you buy this book, it will be because it is surely the handsomest picture book of grasses in existence. Instead of the ubiquitous black and white line drawings (with their own spare sort of good looks) this is a collection of lush water-color in greens, yellows and lavenders on black backgrounds. There's a remarkable amount of personality in all that wavey stuff out there. And good to use for identification: major range grasses, legumes and shrubs, a modest poison plant section.

Prose is just enough, chatty and informative with a Rombauer-like browseability: tumblegrass is also called ticklegrass, geese graze crabgrass out of crops, stinkgrass seeds are two million to the pound, Sand lovegrass is the ice-cream grass of the prairie. Also common names, scientific names, soil types, seeding suggestions, translation of interesting scientific names, palatibility, range, etc.

Designed for lay use, and thus one of the few in the usually encapsulated realms of agrostology and range management. Language is delightfully normal, descriptive English words, and sensual too.

A very pretty book. Creamy.

—Melissa Savage [Suggested by Debbie Oakes]

Pasture and Range Plants
Phillips Petroleum Co.
1963,1974; 175pp.
$6.50 postpaid

from:
Phillips Petroleum Co.
Phillips Bldg.
Bartlesville, OK 74004

TALL FESCUE (Festúca arundinácea)

Gourmet weeds: northwest region

A good guide to edible plants should have good pictures, lists of plants available by season, good habitat descriptions, good collecting advice (which parts? when?) good cooking advice with suggestive recipes, a short list of the truly poisonous plants and enough species that it's worth the bother of carrying it around.

Why Wild Edibles? *is too big for the pocket and has no list of seasonal availability. But: cooking, collecting, habitat descriptions and most and best photos/drawings I've seen. Lots of interesting species — west of the Rockies. Fine info on American Indian use.*

For a much more elementary start, **Northwest Foraging** *is OK (but not outstanding) on collecting, cooking, habitat, and poisonous plants. Great seasonal list is the most attractive part of this book.*

—Peter Warshall

Why Wild Edibles?
(The Joys of Finding, Fixing, and Tasting)
Russ Mohney
1975; 317pp.
$6.95 postpaid
from:
Pacific Search
715 Harris St.
Seattle, WA 98109
or Whole Earth

Northwest Foraging
Doug Benoliel
1974; 171pp.
$4.50 postpaid
from:
Signpost Publications
16812 36th Ave., W.
Lynwood, WA 98036
or Whole Earth

KINNIKINNICK (Arctostaphylos uva-ursi)

This important wild berry, often called bearberry, is suited to a variety of novel uses. Over the years, it has traditionally been drunk, smoked, and eaten raw or cooked. The common name kinnikinnick is taken directly from an Indian dialect and means "smoking plant." For this purpose, the leaves were partially dried and cut into small pieces. As a tobacco substitute, kinnikinnick makes a fine mild smoke.

These were important berries to the Indians, who dried them into large cakes and used them in pemmican, a dried meat product that kept well and was carried along on hunting parties. The dried cakes were an intertribal trade item that brought high prices during years of poor berry growth.

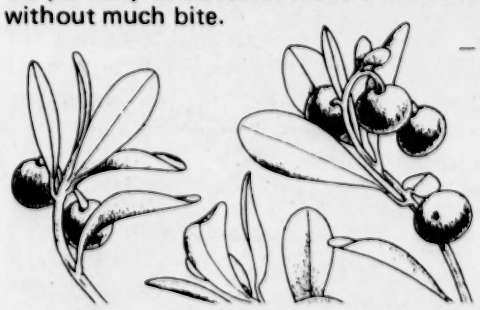
Kinnikinnick is a close relative of the several varieties of manzanita that are found throughout. Use manzanita berries in all the same ways, but the leaves are unsuitable for smoking. Manzanita bark, on the other hand, has medical applications that are not shared by kinnikinnick.

Use: You can eat kinnikinnick raw, but the berries are much better after cooking. They make excellent jams, jellies, pies, and wines. Dry the berries and combine with grated nuts and grains for an outstanding breakfast dish.

Bearberry cider is a popular drink made by crushing the berries and boiling them for a few minutes, just until the seeds are soft. To a quart of the cooked berries and juice, add a quart of water. Allow it to settle for several hours and pour off the resultant juice. It is refreshing and delicious, and quite likely could be allowed to ferment, if desired.

For smoking, allow the leaves to dry for a few hours, then crush. The very dry leaves that are often found on one or more limbs of a healthy bush are a bit too hot to smoke, but the partially dried leaves make a mild tobacco substitute without much bite.

—Why Wild Edibles



Wilson Seed Farms

The virgin prairie is mostly gone, but this company specializes in native American prairie grass seed, for farmers, conservation plantings, and landscaping. They also handle non-native species, legumes, and prairie wildflower seed. If you're after Buffalograss, Sideoats Grama, Western Wheatgrass or Sand Lovegrass, Wilson Seed Farms can fix you up with quantities from one pound on up.

They also have a wealth of how-to information on grasses, lawns and pastures which they sell as mimeographed handouts, for 20 cents each. **Grass Land** *is a booklet of color photography celebrating the prairie; it shows that these folks love the product they sell.*

—Richard Nilsen

Seed price list, and list of handouts free

Grass Land
Jim and Alice Wilson, text
Steven C. Wilson, photography
1967; 30pp.
$2.35 postpaid
all from:
Wilson Seed Farms
Route 1, Box 7
Polk, NB 68654

Psycho-active hops — a research

Gentlemen and Gentlewomen:

I have a problem.

A few months ago I decided to grow some hops. Of course, I needed some seeds or plants or roots or whatever to begin with. This didn't seem to pose much of a problem. I first called Burpee seeds which is headquartered nearby (in Philadelphia). No one seemed to know how to get whatever I would need. They certainly didn't have any hops seeds. Even the horticulturalist there, though pleasant, could not come up with any suggestions. So I called some other seed companies, none of which could supply me with any information.

I decided to call Orlieb's and Schmidt's breweries. I figured they could get me in touch with their hops suppliers. As it turns out, they receive their hops from Scotland. They inferred that there were no suppliers in the U.S., and could give me no more info.

Frustrated, I called the County Agriculturist, the State Agriculturalist, Penn State University Agricultural center, and some other forgotten agencies. The most information I got was that hops is illegal to grow in the U.S., because of a drug that can theoretically be extracted No one knew what the drug is. At the very least, the plant is strictly controlled by the gov't.

The closest I came to gaining access to hops was when I called the Dept. of Commerce. One of the men working there grew up in Northern Pennsylvania where many of the farmers grew it to make beer. He said he'd call me after his vacation trip up there. He called, but only to say he couldn't find anyone growing it.

Well, I've become obsessed now in getting some. From the Library I found that it grows well in this area, is very prolific in growth and production, and is usually started from established plants. It grows much like a grape vine.

You're probably wondering why I want it so bad. Well, first of all, everyone likes to have things that are difficult to come by. And also, since I make my own wine, I might like trying to make some beer . . . with home grown hops. But most of all its because I read in Wm. Daniel Drake Jr.'s **The Connoisseur's Handbook of Marijuana** (Straight Arrow Books) that one can easily graft a stem of hops onto a root of the marijuana plant. The plant grows as hops, but has all the potency of marijuana as far as cannabinol etc. goes. Its in the root of marijuana that the drug is produced. This has obvious advantages in that one's illegal garden goes undetected by neighbors, which is a boon to me since I live in the city and have a lot of people gawking at my garden.

Anyway, if you've been nice enough to read through all of this, I would be overwhelmingly joyful and appreciative if you could supply me with any information on obtaining hops to grow. I'd be glad to pay for your trouble, and you could bill me first. I doubt if government or University type beaurocratic-type agencies will be of help. I just figured you might have some type of access for some freaky reason.

And by the way . . . your Epilog is fantastic. Really. Its changed my life. I've gotten interested in a multitude ideas, crafts, and experiences.

Thanks again.

Paul F. Getty
Upper Darby, PA

Dear Paul:

Your letter is just the kind of floral detective work I love to receive. As you discovered, there is collusion between the Department of Agriculture and the Hop Growers Association of America. It all started during the second World War. The Government was looking for ways to improve hemp rope (known as "Manilla Hemp"). A man named Warmke and a lady named Davidson tried to graft hemp onto the root stock of the hops vine. This failed. But while experimenting, they discovered the opposite graft (hops vine onto Cannibis root stock) worked just fine. In addition, they discovered that THC from the Cannibis root stock entered the hops vine. These hops (grown on marijuana) have a bitter taste — just like hops. Some people like the taste. The high is essentially the same as marijuana but has Lupuline as well as THC, Lupuline is the active ingredient in hops that is chemically related to THC. Its effects give a pot-type high with a heavy sedative overlay. To graft hops onto marijuana, you must cut young marijuana plants above the cotyledons (the two "wings" on the stem that were part of the seed). To be safe, you can cut above the first leaves. Not all grafts will take. Expect some die off. Each hops plant has about six "outlets" or branches. So, for each hops plant, you will need six marijuana plants.

Although there are no laws against growing hops, the Department of Agriculture and the Hop Growers Association have joined together in an unwritten agreement not to sell hops plants and not to provide information about them. The only place I know to obtain hops plants is Wine and the People, 907 University Avenue, Berkeley, California 94710 (near 7th Street; Phone: 549-1266). You cannot grow good hops from seeds. You need root cuttings and these are available only during the dormant period (January, February and March in Washington). So, place your order well before January. Price is generally $2.50 to $2.75 for two root cuttings. But, inquire before sending money.

All this information was kindly provided by the Master Detective of Earth Flora — the Twentieth Century Alchemist. You should write for their pamphlet (POB 4858, San Francisco, CA 94101) called **Legal Highs**. See the EPILOG (p. 497) and the Summer '75 issue of **The Co-Evolution Quarterly**. The original research can be found in the **Carnegie Yearbook** (1942, '43, and '44).

Peter Warshall
The CoEvolution Quarterly

Hops

acres, U.S.A. CONFERENCE

BY RICHARD NILSEN

Kansas City in August may not be your cup of tea, but 500 farmers and feed and fertilizer suppliers showed up here for a three day agricultural conference sponsored by the newspaper Acres, U.S.A. They came from as far away as Canada, Florida, and Oregon. Most everybody went away with genuine cases of information overload, and at times the conference most closely resembled a beehive. Speakers would finish talking and then be surrounded for two more hours by 15 or so farmers and their endless questions.

The big news was all prediction:

- An extremely severe drought will hit America's corn belt in 1976: no rain from July 10th until the middle or end of September.
- Chemical fertilizer prices will increase 25% within the next year, due to increased prices for oil and natural gas. Farmers will be competing directly with industry and home heating for their natural gas, the basis of nitrogen fertilizer.
- The next few years will show sharp increases in human cancers caused by the use of herbicides.

Even Charles Walters Jr., who began publishing Acres in July, 1971, was surprised by the size of the turn-out. A short, fiftyish man with a military air, Walters claims there are one million acres in the U.S. currently being farmed by eco-agricultural methods.

And what is eco-agriculture? (Walter pronounces it 'echo-agriculture'.) Well, it's closer to organic methods than chemical agriculture, but strictly speaking it's neither, or both. I think everyone realizes by now the problems with the terms 'chemical' and 'organic'; as names they are both loaded, and inexact. For example, organic agriculture obviously involves the use of chemicals, and many heavy chemical fertilizers are organic in a chemical sense.

Walters side-stepped this semantic morass, and coined the term eco-agriculture. The closest he came to public definition was when he said: "The old agriculture is failing because it seeks to best nature, rather than live with her. We are not retreating into folklore, or moving sideways into a vacuum. We are involved in a revolution that will sweep agriculture from the soil system to the cash market, and give Americans clean food." He referred to the changes now going on in agriculture as "a sorting out process that is giving air to all the heresies," and saw the end product to be "food of sufficient quality to raise humans who can think and reason . . . those who farm exhausted soil cannot think their way out of this dilemma."

It is easiest to describe the speakers by explaining what they were against: the use, or over-use, of dangerous chemicals (as fertilizers, herbicides, and antibiotics fed to livestock), and conniving, dishonest government regulations. Repeatedly, speakers described their experiences with ineptitude and lying from both the FDA and the USDA, usually in connection with the registration for sale of organic products.

One man described his nine year court battle with the FDA, trying to register a substance called gentian violet, which inhibits mold growth in stored grain. The substance happens to be a lot cheaper than the products sold by the big drug companies, and the man blamed his troubles with FDA on the fact that his product was "competing with the wrong people." Another speaker got a rousing hand when he said: "We need a Secretary of Agriculture, not a Secretary of Agri-business."

Dr. John Whittaker, a veterinarian who writes a column for Acres, explained that the bumper wheat crops we are harvesting today contain 40% less protein than wheat did in 1940, and added: "The soil is dead – soil dilution is a much more important problem than air or water pollution." He also identified the enemy, which he accused of "brain-washing the farmer" as The Big 6: agricultural universities, chemical corporations, Madison Avenue and the press, the feed industry, affluent farmers and ranchers ("who won't listen to you unless you are a member of the Big 6"), and the government.

Whittaker charged the FDA with covering up serious problems in the livestock industry which are caused in part by the over-use of antibiotics and cortisones as medications. This involves the appearance of molds in animal feed, which in turn produce substances which are extremely carcinogenic to both animals and man. Thousands of people and animals died from a similar outbreak of mold toxins in Russia following World War II.

Economics appears to be increasingly important as a factor motivating farmers away from chemical methods towards organic or eco-agriculture. Ex-fertilizer salesman Lee Fryer made the 25% cost increase prediction for fertilizers derived from oil and natural gas, and commented: "The biggest effects influencing the growth of the organic movement are the Arabs and President Ford."

Herbicides Cause Cancer

The scariest talk was delivered by a non-farmer. Dr. Theodor D. Sterling, a biologist and mathematician from Simon Fraser University, Burnaby, British Columbia, looks like he might be Kurt Vonnegut's brother. A world authority on phenoxy herbicides, he began by asking whether it was possible to continue producing bumper crops in North America without poisoning everybody. Clearly, he doubted it.

Herbicides are a spin-off from World War II biological warfare research, and they were quickly put to work after the war to control weeds in farmers' fields. The same kinds of substances we used to defoliate vast areas of Viet Nam were or are used routinely in agriculture.

Sterling said the Mississippi Valley is now polluted with aldrin (recently outlawed), and that when the river floods, the residues are washed to sea. Well, now the pelicans are dying along the Louisiana coast. He compared the pelican to the canaries coal miners take below so they know when their air is getting bad, and added: "What poisons the pelican also poisons all other life, including us; is the death of the pelican not warning enough?"

Aldrin and similar herbicides cause cancers in adults, but there is about a 20 year lag period between the widespread use of the material and the appearance of cancers. According to Sterling, our 20 years are about up. The fact that aldrin has been banned does not get us off the hook; the damage is done. Eleven tons of the stuff was used by U.S. agriculture just in 1974, and it is now found regularly in mothers' milk. I asked Dr. Sterling after his talk what he ate; he just looked at me, shrugged and said, "There is practically no uncontaminated food left to eat."

2-4-5-T and phenoxy herbicides differ in that they affect fetuses and young children. Already, 50% of the malformations in humans at birth observed in British Columbia are from exposure to 2-4-5-T. This same substance has been found in shrimp caught off the coast of Viet Nam *three years after* all defoliation spraying had stopped. As with

cancers in adults, Sterling predicted sharp increases in the numbers of mal-formed and still-born babies in the years to come.

Some of these substances are now banned, but many are still in widespread use; we are eating their carcinogenic residues every day. It took 15 years of debate, studies, and court fights between the government and the chemical companies from the time that somebody first questioned the safety of aldrin until it was banned.

Sterling blamed a lot of the problem on "lying scientists." He told how scientists at Dow Chemical had taken data and drawn completely false conclusions from it for a safety study done for the government. In a separate study of the effects of defoliation on cancer rates in Vietnamese children, the first group went only to Saigon to look at hospital records. Their conclusion: No ill effects. It wasn't until another group went back and checked hospital records in the countryside where the defoliants were used that the real horror show of deformed and dead babies became apparent and the defoliation spraying was finally stopped.

Sterling advocated legislation providing fines and jail sentences for scientists who lie or falsify their findings. But he added: "The damage has already been done; now we shall have to pay a fearful price."

Long Range Weather Forecasting

The prediction of severe drought in 1976 for the U.S. corn belt came from John Cejka, of Cyclomatic Engineering. He sells his predictions to farmers (for example, he told his clients last October to fall plough because the spring of '75 would be too wet) so he didn't get too specific in his forecast, but he did explain how he makes his predictions.

The method was developed in the 1940s by two men working independently from each other: Selby Maxwell and Raymond Wheeler. Maxwell invented the concept of "kinetic energy differential," and Wheeler developed what is known as the "Wheeler cultural curve," but both methods produced similar results: long range weather prediction. Cejka said Wheeler was about 25 years ahead of his time; in 1951 he wrote a book called **The Journal of Human Ecology** in which he predicted the weather through the year 2,000.

The method works because the rate of change in motion between two moving objects — the earth and moon — can be correlated. This is the kinetic energy differential. There is a further correlation between the movement of fluid masses (the oceans) and air masses (the weather); but this relationship has a built-in 15 month time lag. The lag is because of the difference in relative density between water and air. The moon causes tides that happen today; 15 months later this effect is translated to the air masses and produces weather. This sets up a harmonic relationship between water and air masses, and also limits the accuracy of the predictions to 85 - 90%.

Cejka uses the same information in his work that the U.S. Navy uses to predict tides anywhere on the earth — charts which indicate the rate of change in motion of the moon relative to the earth. In some cases the accuracy is astounding, for example, the level of the Great Lakes, which as a huge water-shed indicate over-all moisture levels, were predicted for their height in 1973 to within one inch. The prediction was made in 1964.

The forecasting also incorporates long range drought cycles. Cejka claimed the drought for next year is also part of two cycles which both converge on the 1970s. One is a 170 year cycle; the other 510 years.

New Seaweed Research

Seaweed used as a foliar spray (applied to the leaf surface of plants, rather than into the soil) works, but not for the reasons we all thought. This conclusion came from an English pharmacist named Dr. Gerald Blunden, of Portsmouth Polytechnic College. He used to think foliar seaweed was a fraud, and began his research "to put the final nail into the coffin of seaweed claims."

He began by eliminating the trace elements contained in seaweed as a cause. When diluted and sprayed, the concentrations are simply too small to even begin to correct a trace element deficiency. (For zinc, a year's foliar applications only adds .1 milligram of zinc/acre.) These findings do not necessarily apply to seaweed meal that is added to the soil; in this case the amounts added may be sufficient to provide trace elements.

Seaweed was also thought to contain the three main plant hormones, but Blunden's research eliminated the first two — gibberellins and auxins — one was in insignificant amounts, and the other decomposed too rapidly to be effective. What he did find was incredibly high amounts of a third plant hormone, cytokinin.

Blunden described cytokinins as "safe, non-toxic to humans, and very powerful." When sprayed on a leaf, they are quickly absorbed and stay put in the leaf (are not translocated elsewhere in the plant). What cytokinins do is to stabilize the chlorophyl and the carbohydrate synthesizing system in the leaf, with these beneficial results:

- Proteins are stabilized; for example, treated hay that is cut and baled will have a higher protein content.
- Senescence (aging) is delayed; the plant works longer and produces more. In sugar beets this means more carbohydrate is produced, which means a higher sugar content. The stable leaf structure also means that instead of the beet moving substances from the leaf to the root for storage as the plant begins to die, these substances remain in the leaf. This results in greater beet juice clarity, and less processing to remove impurities.

Some existing claims for seaweed remain valid: crop yield increases for potatoes, improved shelf-life for fruits and vegetables, ability of the plant to with-stand stress, especially marginal frosts and drought, and increased resistance against mites, fungii, and some insects. Increases in germination from soaking seeds in seaweed solution also holds, but only if the solution is sufficiently dilute; Dr. Blunden warned that too strong a solution will inhibit germination.

In all experiments, synthetic cytokinins were used as well, and in all cases they were as effective as seaweed; the catch is they cost 8 or 9 times as much as seaweed spray.

Cytokinins sprayed on a mature leaf will have no effect; the time to apply it is when the leaf area is developing. Tomatoes, for example, should be sprayed just before they bloom. Dr. Blunden thought one application per season would be sufficient in terms of cytokinin content, and advised against any more than 3 sprayings per season, except for orchards, and crops like hay, which can be sprayed after each cutting.

Before cytokinins were identified as an active agent, batches of seaweed spray were not standardized for cytokinin content. One batch would be fine, the next would have nothing — Blunden's research showed they varied from 10 - 280 milligrams/litre of solution. Not surprisingly, Dr. Blunden had some connection with one of the few companies that now standardizes their seaweed spray for cytokinin content: Atlantic & Pacific Research Inc., P.O. Box 14366, North Palm Beach, FL 33408. They call their spray SM-3.

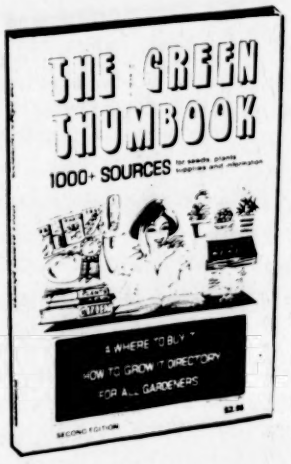
Acres, U.S.A. is a monthly newspaper, and costs $5.50/year, from: 10227 East 61st Street, Raytown, Missouri 64133. ■

The Green Thumbook

This supplants The Gardener's Catalog *(CQ, Winter '74, p. 51) for access to gardening supplies and sources of information – better organized and cheaper. 64 different subject headings plus an index. Already in a second edition, and getting better as it goes along.*

–Richard Nilsen

The Green Thumbook
(1000+ Sources for Seeds, Plants, Supplies and Information)
Marion Schroeder
1975; 112pp.
$2.95 postpaid
from:
Valley Crafts
168 Rainbow Lane
Cary, IL 60013
or Whole Earth



FARMER SEED & NURSERY CO., 818 N.W. 4th, Faribault MN 55021. 507-334-6421. Color il. catalog, 84 p. BAC and MC chgs. Visitors by appointment.

Vegetable and flower seeds, large line of nursery stock, garden tools. Many hybrid introductions, including Univ. of Minnesota and Univ. of New Hampshire, for northern climates. Founded in 1888.

MELLINGER'S INC., 2310 W. South Range Rd., North Lima OH 44452. 216-549-9861. Illustrated catalog, 84 p. BAC and MC charges. Open M-Sat., 8-5.

As the company advertises – 1,000 horticultural items. Plant materials, many hard-to-find, include a wide variety of nursery stock, fruits, nuts and berries, tree and shrub seedlings, bonsai stock, herbs, wildflowers, cacti and other succulents, tree and shrub seeds. Many books on every phase of gardening. Very interesting.

Mellinger's also has one of the most complete listings of tools and related equipment, chemicals and fertilizers, greenhouse and light garden supplies, potting and planting needs, of any mail order catalog. Many aids for organic gardeners, including beneficial insects. A good catalog to have on hand.

•

GAME FOOD NURSERIES, 861 Florida Ave., Box 2371, Oshkosh WI 54901. 414-235-8160. Illustrated catalog, 27 p., $1 (credited.) Seeds, roots, tubers and plants of pondweed, wild celery, wild rice, duckwheat, water cress, wild roses, wild berries, "ecology grasses, blue water iris – and many other wild, aquatic and bog plants, especially for wildlife and conservation plantings." Much information on culture and conservation in catalog. For over 75 years the nursery has specialized in development of feeding and breeding grounds for migratory birds, fish, upland game birds and other wildlife.

•

HHH HORTICULTURAL, 68 Brooktree Rd., Hightstown NJ 08520. Illustrated catalog.

Extensive listing of garden books – including new books of all publishers. "Almost every book in print – in English." Especially recommended are "Hardy Plant Finder," $2.50, and "Tender Plant Finder," $2.25 (both for $4.50). Published by HHH Horticultural, the Finders list many specialized sources for plants and materials, including many foreign sources.

The Magic of Findhorn

The Findhorn community in Scotland is concerned with spiritual growth and planetary evolution, but since it gained recognition originally for an incredible garden – grown in sand and gale force winds, and with the aid of elves and Nature Spirits – many people still connect Findhorn with vegetative gigantism. The garden still exists, but as the author explains, Findhorn has evolved from a garden of plants to a garden of people.

Paul Hawken goes to Findhorn as the doubting American, stays a year, and comes away with a well-paced and convincing book, except for a few lapses where he tries too hard to be a stylistic Tom Wolfe. The occasional specific advice on gardening is probably too far out for most readers to accept, as when the god Pan explains that every garden should have a wild area that is never weeded or tended, to serve as a sanctuary for Nature Spirits.

The links this community has re-forged with the Spirit world will set your rational mind on edge every bit as fast as don Juan, and make you wonder if Tolkien was purely a writer of fiction.

–Richard Nilsen

The Magic of Findhorn
Paul Hawken
1975; 216pp.
$8.95 postpaid
from:
Harper & Row Pub., Inc.
Keystone Industrial Park
Scranton, PA 18512
or Whole Earth

I asked Mathew why the plants were more normal now.

"The growth here was fantastic to demonstrate to Peter Caddy and to others that it was possible. Now we know it is possible to work with the Nature Kingdom, but we no longer have the need to produce a plant where it won't normally grow. . . . If you show somebody a forty-pound cabbage, they get hung up in the forty-pound-cabbage trip and think only in terms of size, form, and quantity. They take for granted the being and consciousness behind that cabbage. Instead, all they see is the size, not the beauty and perfection of it."

I must admit, I had hoped to see one of those cabbages.

. . . Everywhere I put my hand into the soil there was sand two or three inches under the compost. It is like gardening on a beach. Yet staring at you and waving brightly in the sun is a compact bunch of healthy flowers. It defies rational analysis, and so far, no scientific authority has been able to explain the phenomenon of Findhorn.

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Dorothy began to use the word "Deva" (a Hindu word meaning "a being of light") to describe the beings she was contacting.

As they moved into summer hundreds of messages were received from the Devas and other overlighting angels, including:

Dwarf Bean Deva: *The first lot was sown too deeply and before the forces in the garden were great enough. They won't come up properly.*

Tomato Deva: *It is shivery for them, but we shall try to protect. You can give them liquid manure now. Leave the windbreaks on at the moment until the fruit is somewhat formed.*

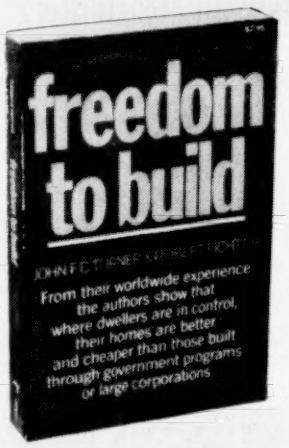
Spinach Deva: *If you want strong natural growth of the leaf, the plants will have to be wider apart than they are at the moment. By leaving them as they are, you will get overall as much bulk in the leaves, perhaps a little tender, but with not as strong a life force.*

Shelter

Freedom to Build

"I been sayin' that for years" . . . this is one of those books. And well put together too. This is a collection of papers based on many years of worldwide experience by several authors. They believe that people can take care of their own housing needs better than a big government or corporate project can, and the arguments are documented with a series of drastic examples. In contrast to many books of social ills, these authors make solid suggestions for reform. This is an "ammunition" book, one that you can quote while making your point at a planning session. I found it unusually exciting and disturbing.

—J. Baldwin


freedom
to build
From their worldwide experience the authors show that where dwellers are in control, their homes are better and cheaper than those built through government programs or large corporations

Freedom to Build
John F. C. Turner &
Robert Fichter, Eds.
1972; 301pp.

$2.95 postpaid
from:
MacMillan Pub. Co., Inc.
Order Dept.
Front & Brown Sts.
Riverside, NJ 08075
or Whole Earth

Although building codes have made great contributions to human welfare in countries with high per capita incomes, their rigidity often contributes to a shortage of safe and sanitary housing. In many cities of the U.S., for example, owner-building is virtually prohibited, and in many more the administration of building codes is an important factor in the precipitate abandonment of older housing, so badly needed by the urban poor.

Why are the "problems" so universally defined in terms of what people *ought* to have (in the view of the problem-staters) instead of in realistic terms of what people *could* have?

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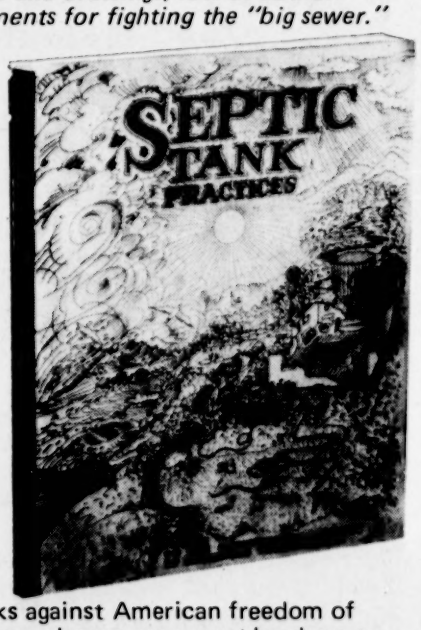
The well-intentioned professional, schooled in the liberal authoritarian tradition of presumed superiority of the institutionally educated, is undoubtedly the most successful builder of hell-on-earth.

Publicly subsidized and built "urban renewal' housing in Korea, 1970. In the foreground, a squatter family's dwelling erected among the ruins of a former home destroyed in order to relocate the occupants in the new apartment block in the background. Another block, in a similar relocation program, had collapsed weeks before the photograph was taken, killing thirty-two occupants, and other blocks in the project were promptly evacuated and demolished. Patrick W. Crooke

Septic Tank Practices

A lively discourse (by one of The CQ*'s Land Use editors) on the theory, construction, care and feeding of septic tank systems as well as suggestions for conserving and reusing household waste water ("grey water"). The complete poop, so to speak. Many diagrams and drawings, lots of authoritative facts, and good arguments for fighting the "big sewer."*

—J. Baldwin



Septic Tank Practices
(A Primer in the
Conservation and
Re-use of Household
Wastewaters)
Peter Warshall
1975; 76pp.

$2.75 postpaid
from:
Peter Warshall
Box 42, Elm Rd.
Bolinas, CA 94924

Finally, the Big Sewer works against American freedom of choice. If a sewer runs by your house, you *must* hook up to it and pay the costs. In other words, you are not allowed to keep your home-site system with all its advantages — even if it's working beautifully. This loss of option is killing the old American sense of self-reliance and responsibility. Undoubtedly, some back-woods Benjamin Franklin, unimpressed by the language of city-educated sewage experts, will soon stand up and say: "I won't." It will be a fine American court battle.

Home-site sewage treatment is cheaper, pollutes less, recycles more, slows or controls suburban sprawl, has fewer health hazards, and remains personal and intimate with the necessities of water, nutrients, and the lives of other creatures. Centralized sewage disposal, shielded by public authorities, has kept citizens unaware of sewage costs, inadequate treatment and disposal as well as their own natural responsibility for recycling their own wastes and keeping other plants and animals productive and healthy.

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DRAINFIELD CONSTRUCTION

WARNING: Trenches should be dug with a back-hoe or by hand tools. Seepage pits can be dug with a back-hoe, bucket auger or hand tools. Do not use spiral augers or trenchers. This equipment will compact the sidewalls and smear the infiltration surface — totally ruining the treatment process.

IDEAL TRENCH FILL
(Expensive and more difficult)

Use It Again, Sam

Showing how to use disposable containers as construction material. More important, showing how disposable containers could be DESIGNED and manufactured for re-use as construction material. Another excellent study from the McGill University group that did **Stop the Five Gallon Flush!** *(EPILOG p. 487) and* **The Ecol Operation** *(EPILOG p. 508). Next: rooftop gardens.*

–SB

Use It Again, Sam
Witold Rybczynski, Ed.
1975; 60pp.
$3.00 postpaid
from:
The Minimum Cost Housing Group
School of Architecture
McGill University
Montreal H3C 3G1
Canada

The interlocking gallon bottle could play an important role in disaster relief; starting its life as a container for water or medical supplies, it can be reincarnated as a building block. The bottles are filled with a wet sand/lime mixture which, in about six months, will harden to a rock-like block. In the meantime, it can immediately be used for building, being joined together with adhesive. The transportation of medicaments (first priority) thus expedites the provision of shelter (second priority).

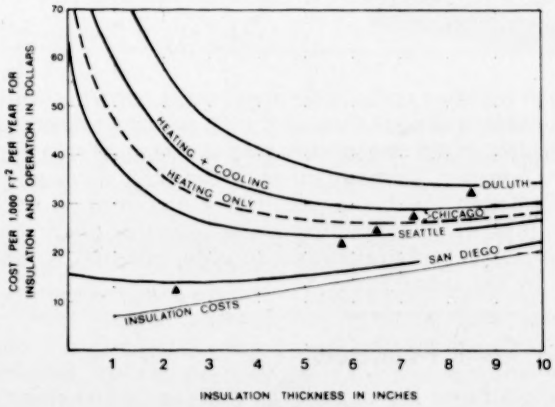
Insulation

The real name of the game for saving energy in dwellings is insulation. This is particularly true of existing structures that may not be easily adapted to solar or other forms of "alternative" energy. These two booklets give very useful information. **Insulation Manual** *shows clearly how to figure insulation needs for heating and air conditioning with a large variety of materials and construction methods. Intended for contractors, it has tables for computing the needs in all 50 states.* **Optimum Insulation Thickness in Wood-Framed Homes** *shows how to figure cost versus thickness, cost being both insulation costs and energy costs saved over the life of the building. This book covers fiberglass only, but their methodology could easily be adapted to other materials. The two books together should enable you to do a pretty rational job.*

–J. Baldwin

Insulation Manual
NAHB (National Association of Home Builders Research Foundation, Inc.)
1971; 44pp.
$4.00 postpaid
from:
NAHB
P.O. Box 1627
Rockville, MD 20850

Optimum Insulation Thickness in Wood-Framed Homes
USDA Forest Service
General Technical Report
PNW-32
A.E. Oviatt
1975; 37pp.
$ .85 postpaid
from:
NAHB
P.O. Box 1627
Rockville, MD 20850



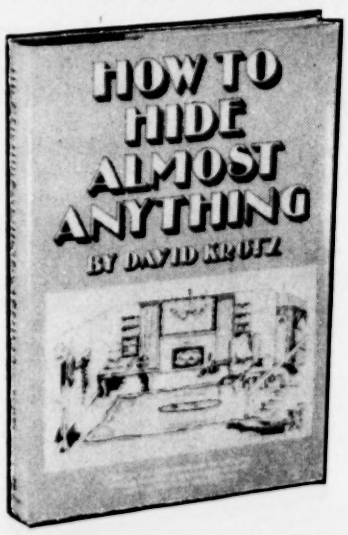
Optimum roof-ceiling insulation thickness.

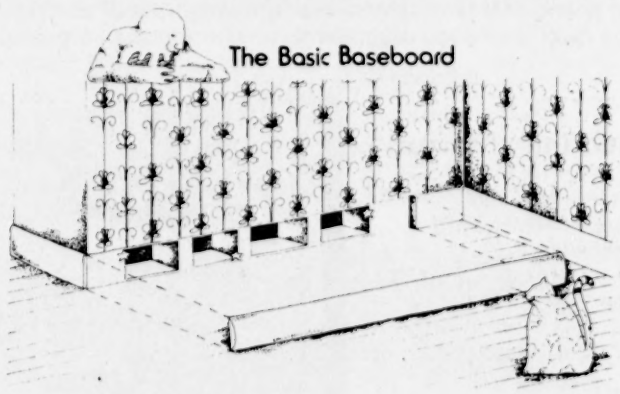
How to Hide Almost Anything

An amusing and clever book of proven hiding places for your valuable belongings and substances written by a man whose business is making hidey holes. Written and illustrated with considerable wit.

–J. Baldwin

How to Hide Almost Anything
David Krotz
1975; 157pp.
$5.95 postpaid
from:
William Morrow and Co.
Wilmor Warehouse
6 Henderson Dr.
West Caldwell, NJ 07006
or Whole Earth





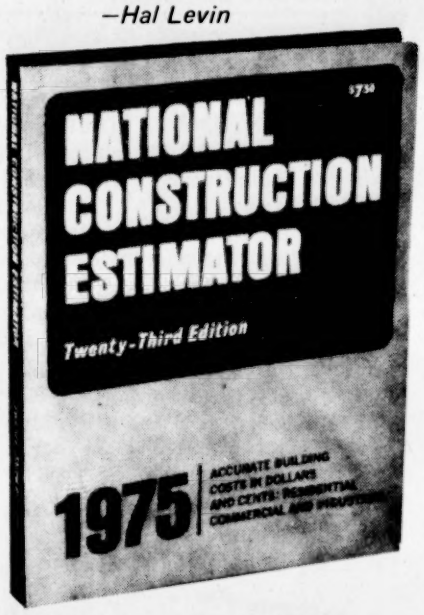
There's probably only one fastening device you'll want to consider for this particular hidey hole: the cabinet fastener snap. But I've built some with nail friction fastenings, and Velcro too. Decide for yourself after reading Chapter 7 on fasteners and locks.

Once snapped in place the baseboard secret place is done. You'll sit in a chair with a smug satisfaction. You and no one else will know what the normal-looking wall really contains. Don't look at the baseboard that way too long. Once you've hidden your valuables away, content yourself to visualize the hidey hole in your mind's eye while you get back to the business of questing a pleasant life rhythm.

National Construction Estimator

The 1975 edition is $7.50, and is well worth every penny to the owner-builder or carpenter/free-lance builder. The information provided allows estimating materials and labor costs. By using the wage rates table, labor costs can be converted to time estimates for skilled labor, thus, the owner-builder can calculate average time required for a specific job, he can use the information to decide whether to do the job himself or hire someone based on time/skill/cost/job desireability considerations. The materials list also provides a good survey of available alternatives. Information of this type is quite valuable to owner-builders as well as professionals. Quick cost comparisons of alternatives are quite easy.

—Hal Levin



National Construction Estimator
Twenty-Third Edition
Gary Moselle, Ed.
1974; 275pp.
$7.50 postpaid
from:
Craftsman Book Co.
of America
542 Stevens Ave.
Solana Beach, CA 92075
or Whole Earth

The percent saving in heat loss is five times greater if glass areas are reduced than would be achieved by increasing wall insulation.

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ITEM	UNIT	MATERIAL	LABOR	TOTAL
ELECTRICAL MATERIALS, continued				
Conduit (labor setting and aligning, heights to 10')				
Rigid galvanized (installed in wood frame building), including fittings and supports				
1"	LF	.96	2.38	3.34
1¼"	LF	1.19	2.38	3.57
1½"	LF	1.43	2.50	3.93
2"	LF	1.90	3.30	5.20
Romex cable, non-metallic sheathed (labor boring out, pulling and securing cable, no connecting, 50' run)				
2 wire, without ground wire				
14 gauge	LF	.14	.33	.47
12 gauge	LF	.16	.40	.56
10 gauge	LF	.21	.46	.67

"Waterless" shower

Using a principle demonstrated by Bucky Fuller many years ago, the Minuse shower reduces water consumption 88% by injecting air into the stream. The effect (claimed) is very similar to a regular shower, but water use is down from the usual 5 gallons to ½ gallon a minute. Energy savings are impressive: in addition to saving water, there is a saving on heating the water and disposing of the wastewater. Power consumption of the air pump is a small fraction of that used by a water heater. Sounds like a worthwhile step in the right direction, though a less gadgety way of accomplishing the same results would be more desirable.

—J. Baldwin [suggested by Brian Smythe]

Minuse Shower
$300.00
from:
Minuse Systems, Inc.
206 North Main St. Suite 300
Jackson, CA 95642

SmokeGard

As a youngster I nearly perished in a house fire. The smoke was caused by burning insulation but I was saved when my younger sister woke us up. Statitrol Corporation sells a self-contained (operates if fire causes power to go out) ionization smoke detector. It sells for $42.50. If you live in a house with children and aren't 100% sure about its fire safeness it might be a prudent buy.

James G. Pech
Aurora, Ohio

There are many other systems available. We don't know which are most effective.

—J. Baldwin

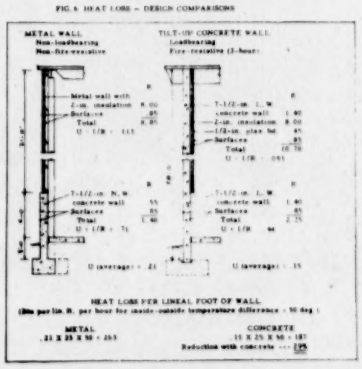
SmokeGard
$42.50 postpaid
from:
Statitrol Corporation
140 S. Union Blvd.
Lakewood, CO 80228

Concrete and Energy

The Portland Cement Association shows how concrete can save energy in just about every way you can think of except saving energy by not making concrete. Effect of window area on heat loss is shown and the "thermal flywheel" advantages of heavy construction are discussed. Lots of good things for builders to know about. Many comparisons of various construction methods.

—J. Baldwin

The Concrete Approach to Energy Conservation
Portland Cement Association
1974; 49pp.
$2.10 postpaid
from:
Portland Cement Assn.
Old Orchard Rd.
Skokie, IL 60076

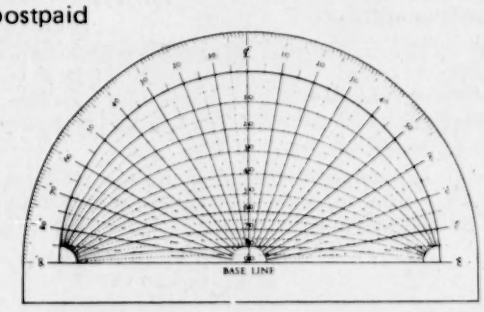


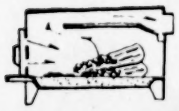
Climate and House Design

Presents a climate-conscious design strategy for housing. Includes a device and tables for determining shadow angles.

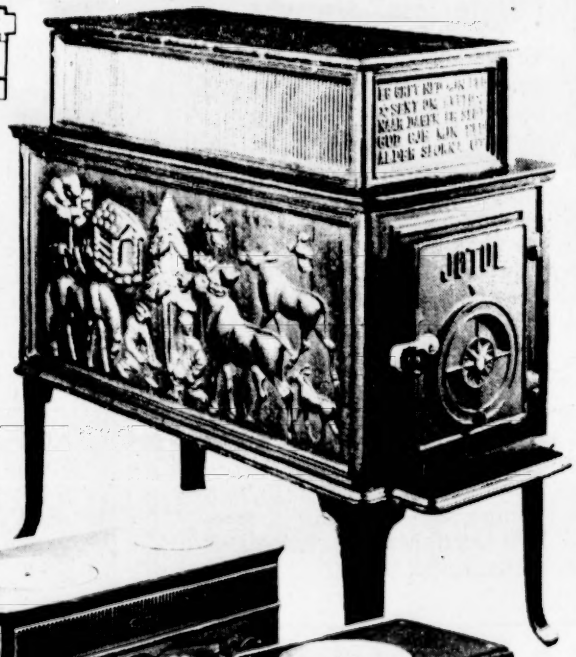
—Hal Levin [Suggested by Joseph LoMonaco]

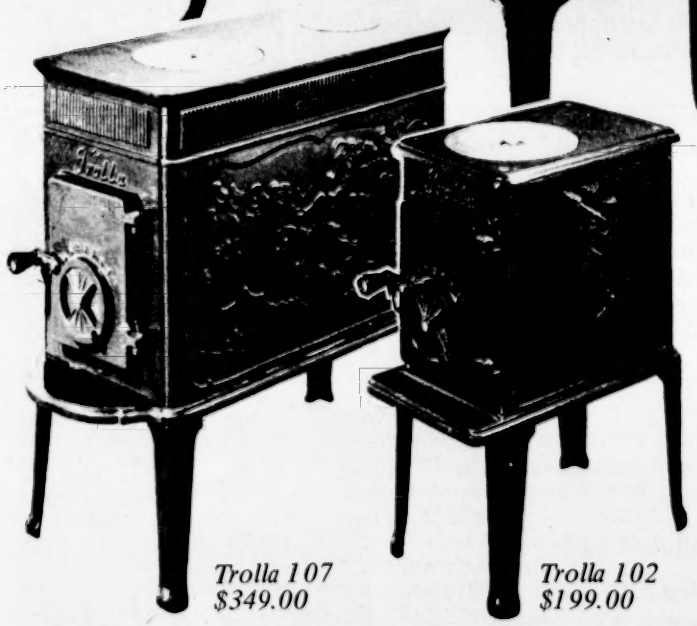
Climate and House Design
Design of Low-Cost Housing and Community Facilities, Vol. I
United Nations
1971; 93pp.
$2.50 postpaid
from:
United Nations
Sales Section
New York, NY 10017





Jøtul 118
Black $400
Green $445





Trolla 107
$349.00

Trolla 102
$199.00

Scandinavian Wood Stoves

Dear Stewart Brand,

Planned to write Stove Report II before leaving for Europe but no time. Enclosing some literature on a truly excellent stove, the Lange from Svendborg, Denmark. Photos, baffle diagrams, etc. I've seen three Scandinavian stoves now—— and used two of them extensively. Jøtul and Lange I've used, Trolla I've seen, and talked to people who have used it. All are good stoves—— as a breed the Scandinavian stoves seem to be the best around. (If there are any better, I haven't been able to uncover them.) I use a Lange in my own house.

For those who want them:

For Jøtul, contact Kristia Associates, P.O. Box 1461, Portland, Maine, 04104 (the importers).

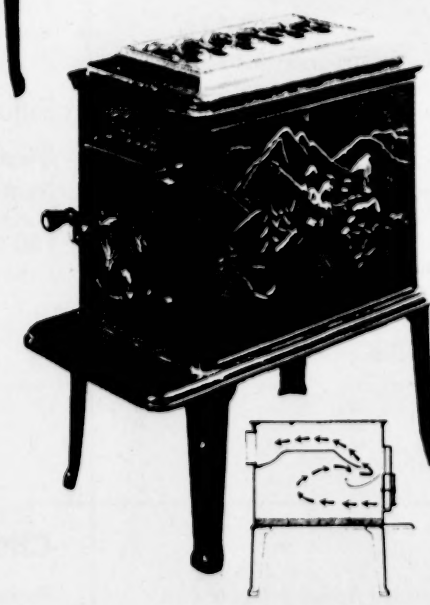
For Lange, contact Scandinavian Stoves, Inc., Box 72, Alstead, N.H. 03602. (That's me—— I also sell Jøtuls.) Single stove orders for Langes may be made from William Seale Repair, River Street, Alstead, NH 03602, (603) 835 - 6722. It's a good idea to call when ordering to make sure model is available in color choice and that prices haven't risen (he said they are subject to slight increases). He is closed Sundays and Wednesdays. Prepay stove plus $15.00 crating charge then stove is sent freight collect (he says it would cost about $30 - $40 cross country).

For Trolla, contact Portland Stove Foundry, 57 Kennebec, Portland, Maine, 04101. Trollas are sent at prices listed, plus $10 crating charge and freight collect from their factory.

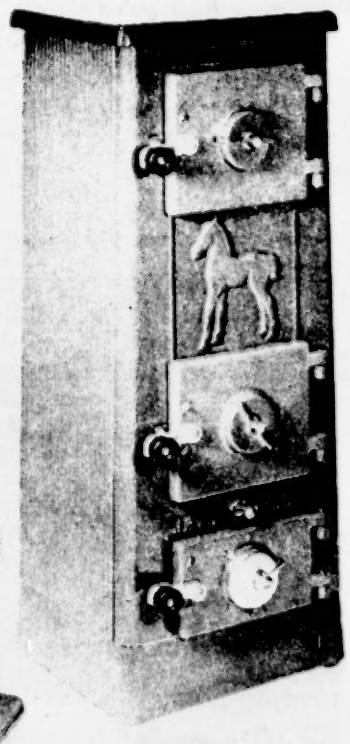
Going to see what else I can find in the way of good stoves in Europe—— report later,

Best wishes,

David Lyle
Alstead, New Hampshire



Trolla 105
$245.00



Jøtul 507
$355 (coal & coke – or wood)

Jøtul 602
Black $225
Green $255

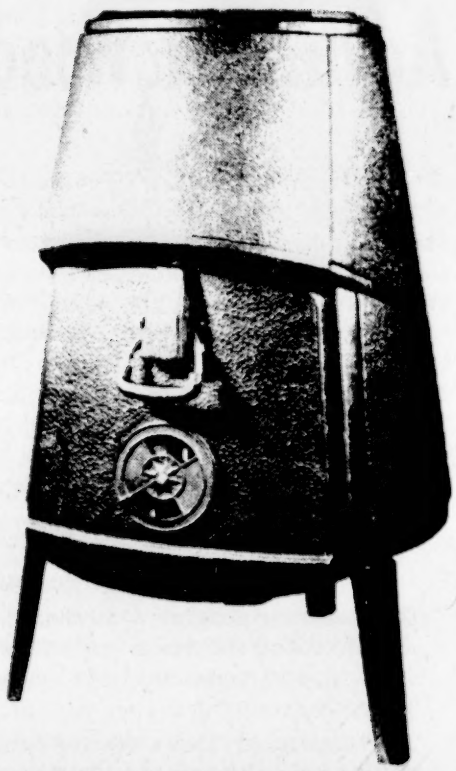
The stove-making tradition in Scandinavia goes back hundreds of years. It goes back to an earlier energy crisis, when wood became scarce in northern Europe. Competitions were held then to produce more efficient stoves—— stoves that produced maximum heat on a minimum of wood. The result, refined many times by experiment, is the Scandinavian wood stove of today. We believe these are the best stoves in the world. "Scandinavian Wood Stoves" carries two lines—— the Jøtul stoves from Norway, and the Lange stoves from Denmark. Here are some facts about them:

- All models are made of cast iron—— heavy plates that are durable and safe, that hold heat and radiate it evenly.
- Most models have internal baffle systems. These keep the heated air in the stove longer, so more heat goes into the room, less up the chimney. The result is high efficiency.
- The box stoves (and some fireplaces when closed) are airtight. This makes it possible to control burning completely through the draft regulator. Fires thus burn evenly and long on a minimum of fuel. The Scandinavian system accomplishes the same thing as the "thermostat" on some American stoves—— but by a different method.
- Because of the baffle plates, most models burn wood from end to end, like a cigar. This gives a steady, even fire which will hold overnight. In the morning, just rake the coals to the front of the stove and put more wood on.
- Enamel finish available on most models. (Green, blue, red, etc.) Enamel is easy to clean, makes stove blacking unnecessary.

Scandinavian Stoves
Box 72
Alstead, NH 03602

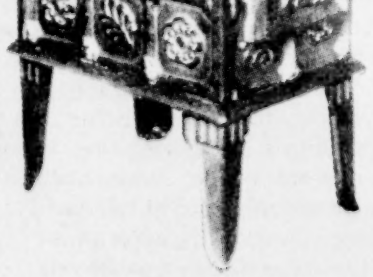
Jøtul 404
$540 (cookstove)

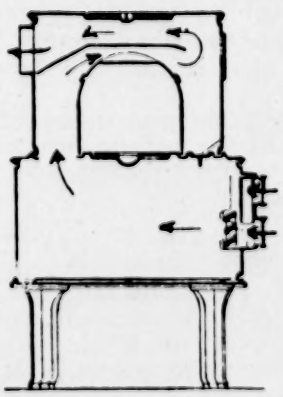
Jøtul 4
("Combi-fire"-- fireplace or stove)
Black $525; green 620



Lange 6303A
$220.00 black
$265.00 enamel
(red, blue,
or green)

Lange 6203BR
$295.00 black
$345.00 enamel





Lange 6303
$315.00 black only

The L. Lange Co. of Svendborg, Denmark has been making wood stoves for 125 years. For quality of workmanship, for durability and efficiency, we think their products are unsurpassed.

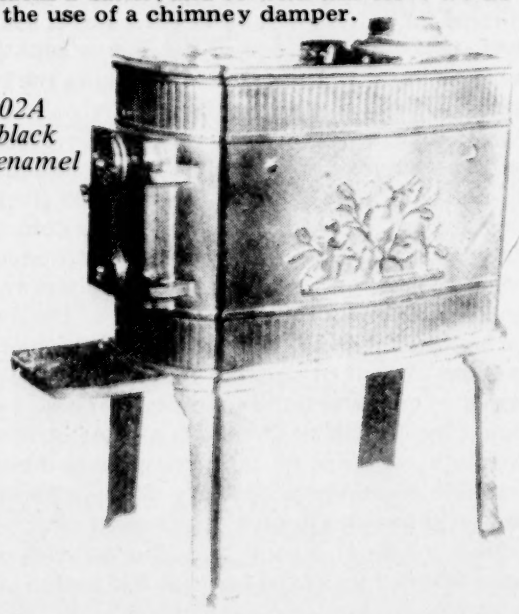
Their stoves are air-tight. Doors are hand-filed to fit each stove individually. All joints are sealed with cement. This means the rate of burning is easily controlled through the draft regulators. A fire will hold overnight on one load of wood. And as with other air-tight stoves, you'll consume less wood.

On most Lange stoves there are two draft regulators on the door of the stove, one above the other. When you start a fire, open both regulators all the way. Once the fire is burning well, close the lower regulator completely and use only the upper to admit air to the fire chamber. In this way the air will be preheated by passing through the chamber on the inner face of the door. (On Model 6302A, when starting a fire pull out the knob above the upper draft regulator; push the knob in completely when the fire is going.)

Most Lange stoves have baffle systems. These (along with the draft regulators) help control the rate of combustion so that the stoves give a steady, even heat in the house and less going up the chimney.

The baffles and air-tight construction make chimney dampers unnecessary with these stoves. We recommend against using dampers on any stove with a baffle—— except in the occasional instance of an unusually strong chimney draft. The Lange model 6303A lacks a baffle, and so with this stove we do suggest the use of a chimney damper.

Lange 6302A
$375.00 black
$450.00 enamel



Advanced Wood-Burning

BY DOUG DYLLA

For ages humanity was dependent solely (soully) on the warmth and the light provided by a wood fire for survival. Within the past century, however, much of the earth's finite reserves of coal and oil have been consumed as fuel for cooking and heating in our homes. In this essay, though, I wish to focus on wood once again, for its use as a fuel for the contemporary homestead. I am speaking mostly from experience, enthusiastically because wood is such an economical, efficient, and renewable resource; hesitantly because our native forests are easily exploited, and personal carelessness with wood fires can easily lead to disaster.

First, some **quick advice** and then some explanations:

1. Whenever possible, you should burn only seasoned wood. Wood should be cut a year before use, split, stacked, and protected from the weather for it to be properly seasoned.
2. You should clean your stovepipe/chimney regularly during your fire season. Metal stove-pipes once a month. Chimneys twice a year.
3. You should always clean your stovepipe/chimney before starting the first fire of the season.
4. You should be extremely cautious when installing a new stovepipe, giving it enough clearance from flammable parts of the house. (6" - 8" minimum from any wood framing or siding.)
5. You should eventually build chimneys for all stoves rather than using stovepipe year after year.
6. You should always be aware of the constant danger of a wood fire. For your own safety you should have fire extinguishers handy and escape exits from all rooms. (Yurts go up like matches.)

•

You should try as an ideal to only burn dry, seasoned wood in your stoves or fireplace. Most wood, if cut, split, and stacked out of the weather will be fairly well seasoned within a year's time. Wood that is not split takes much longer to season since it has less surface area than when split. Wood that is green or wet should only be used at last resort because it does not burn nearly as efficiently as seasoned wood. If you are forced to burn green wood though, you must always keep in mind the build-up of moisture and creosote that will be condensing in your chimney and/or especially in your stovepipe. This sooty layer will coat the inside of the flue or pipe and very quickly decrease your draft and eventually clog the entire opening unless cleaned. This creosote is extremely dangerous because if given enough time to dry out will ignite like gasoline or kerosene up your pipe. I would recommend cleaning your stove-pipe at least once a month if your stove is in almost constant use, especially if you live in a cold climate. This build-up is much more of a problem in metal stove-pipe than a block chimney because the moisture and creosote tends to condense on the thin walls of the metal pipe when the hot gases hit the cold atmosphere than in a thick, smooth-surfaced cement or ceramic flue and chimney. See Fig. 1 for details of creosote build-up on stove-pipe. I would recommend cleaning block chimneys at least once or twice a year. Usually a stovepipe must be completely dismantled for thorough cleaning. A chimney can be cleaned relatively easily if it has an ash pit or door at its base by one of the following means: a rope from the top with rags or newspaper wadded up at the bottom and pulled upward; chains carefully rattled about scraping the sides; controlled and uncontrolled burning it out; an imported midget chimney sweep; Santa Claus. I do not put much faith in these commercially available chemical chimney cleaners.

You can usually tell when your pipe or chimney needs cleaning during the fire season: 1. your draft will be noticeably worse than you remember it to be; 2. it will smoke when starting fire; 3. it will smoke during a mild to medium wind; 4. black streams of creosote will be dripping down the pipe outside and inside. Even if you have a chimney for your woodstove, make sure to clean the stovepipe from the stove to the opening of the chimney regularly.

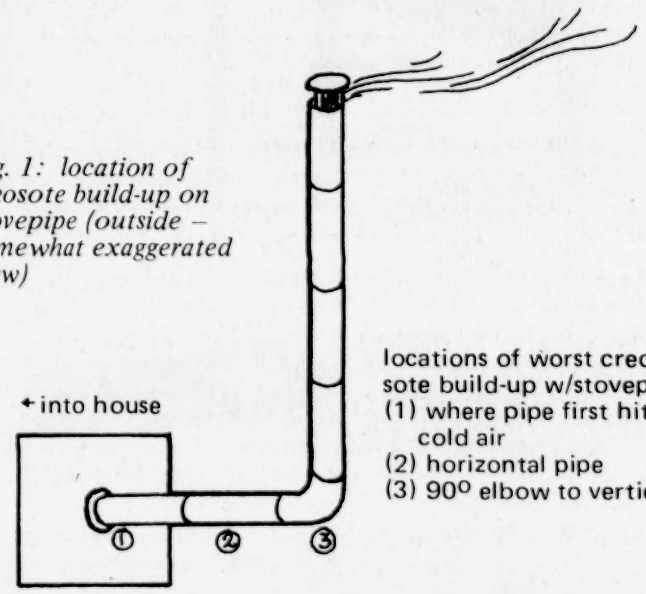


Fig. 1: location of creosote build-up on stovepipe (outside – somewhat exaggerated view)

Before you start the first fire of the season (or the first one in several weeks or months) in your stove or fireplace, make sure you clean it out. VERY IMPORTANT! Especially if you live in a house/home with a wooden roof or in a dry area. Ever heard of a chimney fire? The creosote builds up on the sides of a pipe or chimney, and dries out over a few months. One cold day a fire is started in the stove or fireplace and VAVOOM! Flames are leaping out of the chimney or stovepipe; they're really heating up; and sparks are flying out all over. Very dangerous if they are landing on your hand-split shake roof. Of course, I have seen chimneys burn up the creosote safely, that is, without burning up the house or the surrounding section. A very hot, quick fire after a few dry months will usually set if off – but it's risky business unless you are Smoky the Bear – I'll settle for hand cleaning.

Most of the fires I have seen that were caused by wood stoves originated at the point where the stovepipe extends through the wall or roof of the house. A stovepipe can really heat up; carelessly placing the stovepipe within a few inches of a wooden surface will usually result in a smoldering fire. Please be cautious about putting up new stove-pipe. Beware of the piss-poor metal ducts that are commonly sold at hardware stores for the purpose of passing stovepipe through a wall (see Fig. 2). These ducts are useless and even treacherous; I have yet to see one prevent a fire. The two inches of air gap they provide is not enough protection; even with asbestoes surrounding them I could not recommend them.

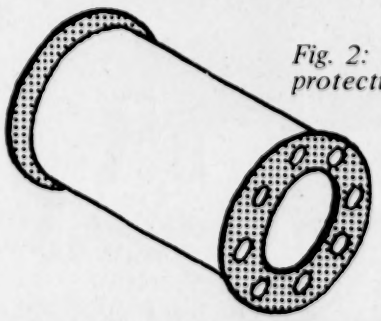


Fig. 2: Piss-poor metal ducts sold for protecting wall around stovepipe:

Collars fit various diam. size stovepipe and provide abt. 2" air gap between pipe & wall. Not enough!

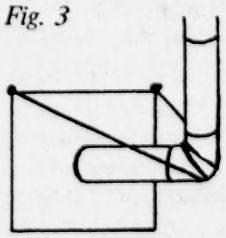
Here are some of my thoughts on **mounting stovepipe** safely:

1. One or two sheets of galvanized sheet metal tacked up instead of a window frame (or in a rectangular cut-out in the wall or roof) with at least a foot of metal between the pipe and frame in all directions. Pipe is supported on both sides by wire or chain so weight is not on sheet metal. See Fig. 3a.
2. As in number 1 but plywood instead of sheet metal in window frame with a 1 - 2" thick round ceramic flue surrounding pipe. Fig. 3b.
3. For a sauna or for extra protection where the stove-pipe will glow red-hot: frame up a chimney block with circular hole, put ceramic pipe in, put stovepipe inside that, seal seams with cement.

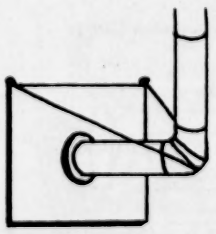
Other miscellaneous thoughts and advice on **stovepipe**:

1. Make sure it extends above the peak of the house for proper draft.
2. I haven't found too much difference between the galvanized pipe and the plain black pipe (cheaper).
3. Use a stovepipe cap for protection from down drafts and rain.
4. Replace all pipe when it appears to be deteriorating (2 - 4 years depending on use).
5. Cut pipe before assembling rather than after if you must cut to fit properly.
6. Make sure you have more vertical pipe than horizontal or you will have lots of problems with draft and soot.
7. Make sure stovepipe is away from all wood in house or outside house by at least 6" - 8". More protection if possible.
8. Support stovepipe at its 90° joints with chain or wire to a wall of house. And every 4 - 6 feet of its outside vertical climb.
9. If your pipe is clean, your pipe safely above the peak of your house, etc., and you are still having draft problems with a stove; there is a special (and expensive) cap that can be obtained from most sheet metal stores. This cap has rotating fins that help create a draft when the wind hits the fins. See Fig. 4. This cap is very useful sometimes, but even it will not work if your pipe is clogged with creosote.

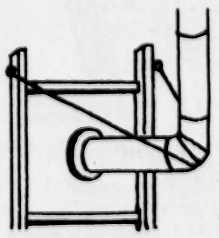
Fig. 3



a. Sheet of galvanized sheet metal with 6" hole cut in center in place of glass in a window frame, or in opening in wall. Allow abt. 8" from pipe to wood.



b. Plywood covering opening or window frame w/1" thick ceramic pipe surrounding stovepipe through plywood hole. Wire or chain supports of pipe.



c. In sauna, where extra protection is needed when stove pipe can glow red-hot. Frame up concrete chimney block, use ceramic flue to surround pipe through wall. Heavy but safe. Fill gaps w/ cement to prevent air leakage into sauna.

Fig. 4: Special Stovepipe Cap w/Fins

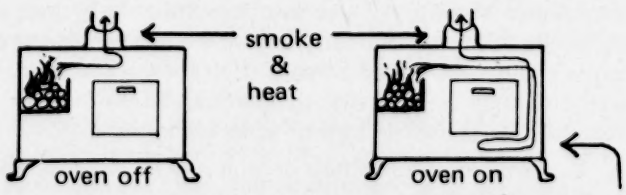
Fins rotate when wind hits them creating a draft in stovepipe.

I would whole-heartedly recommend your building a masonry chimney for any permanent stove you intend to use. Reasons: the draft is much better in a chimney; the creosote build-up is much less in a chimney; a chimney is easier to clean; a permanent chimney means no more bi-annual stove-pipe replacements; and you will feel a hell of a lot safer.

On **stoves and cookstoves**:

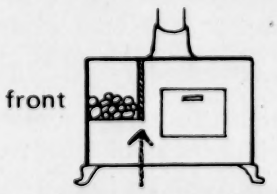
1. Keep your ashbox cleared often so your draft can work properly (but keep some ashes on the grates to protect them from the intense heat of the coals).
2. Cut your wood in lengths small enough to lay flat in your stove so they can burn efficiently. Most parlor stoves can take 15" to 20", cookstoves about 12" to 15"; our small sauna stove-chicken brooder could only take 8" to 10"; fireplaces can usually take 18" to 24".
3. Put a damper in the pipe for the most efficient burning. Some people even put two. The miniature blowers installed in the stovepipe seem to be very effective and worthwhile, but expensive.
4. Just about any good-size stove can burn overnight by experimenting with big chunks of hardwood on top of coals, and the drafts closed tight. You want the fire to peak about 4 - 5 AM so there are still coals by 6 - 8 AM. So don't try and get a roaring fire at midnight. You want a low, slow fire all night. Some people put ashes on top of the wood to slow it down.
5. Seal any crack in the cast iron casing of a stove with furnace cement.
6. Stove blacking just burns off with a bad smell; I don't think the color is worth the smell.
7. Make sure the vents for the oven of a cookstove are cleaned regularly of ash or it will smoke when the oven lever is turned on and the oven will not work properly. See Fig. 5.
8. There are special units available for installation in a cookstove which are heavy pipes which circulate water on the side of the firebox to be heated. See Fig. 6.
9. Don't burn a lot of paper and garbage in stoves.

Fig. 5: Oven workings in cookstove

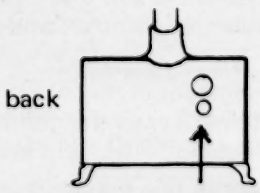


Clean vents below oven of ash so smoke and heat can circulate around oven easily.

Fig. 6: Water heater units in cookstoves.



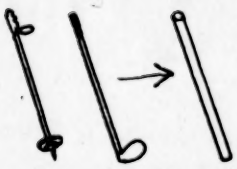
Unit replaces cast iron side of firebox



Two holes for pipes inlet/ outlet into unit and back to tank.

[more →]

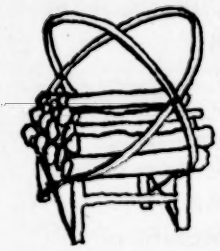
Fig. 7 & 8: Handy gadgets.



Cut ski poles & golf clubs into handy blow pipes. Ignite logs in fireplace w/lungs.

Canvas log-toting case with dowels handles

wires in edges to keep "U" shape



Two metal hoops 2' - 4' o.d. (old wagon wheels, etc.) bolted together in two places, spread apart 12" - 14", bolted to stand to hold logs by stove.

On **fireplaces**:

1. Beautiful but inefficient.
2. According to the **Woodburners Handbook** by David Havens, "an ordinary fireplace takes nearly 10 times as much wood as a stove to heat a room equally well."
3. A "thermograte" works pretty well, but a fireplace is a hog.

Handy **gadgets** for woodburners:

1. Cut off the ends of a ski pole, golf club, or other light, strong pole. There you have a long tube for blowing on fires to ignite them.
2. A canvas carrying satchel for logs: See Fig. 7. Canvas sewn in U-shape with wooden handles and wire edges so it stays in shape when loading and unloading logs.
3. Two metal hoops of 2 - 4 ft. diameter bolted together at two points and spread about 12" at widest and bolted to stand (to hold firewood by stove.) Its useful to record daily consumption. Fig. 8.

On **gathering wood**:

For wood to be considered an economical fuel, you must gather it yourself and/or with friends. The most common methods of cutting firewood are with a chain saw or a buzz saw. Most people use only a chain saw, and from my experience I would have to say that Stihl chain saws appear to be the best commercially available. I must also say that while chain saws are extremely useful, they are also extremely noisy, smelly, and dangerous. Some other suggestions for taking care of your chain-saw:

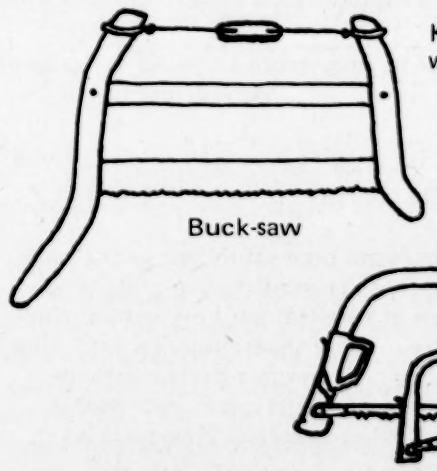
1. Keep the chain sharp or you will be wasting your time and energy.
2. Keep the depth gauges filed below the cutters on the chain so that you maintain a good "bite" as you file down the teeth. (Most saw manufacturers make gauges for filing).
3. Keep the saw clean of sawdust, chips, etc., especially around the sprocket and air filter.
4. Don't use a good chain where there are chances of damaging it in dirt or on rocks. If you have to do work which is low to the ground, get yourself a cheap "grubbing" chain and save your good chain for other work.
5. Make sure you stop and rest when you are tired (every gasing or so) because a chain saw will just keep on working hour after hour if it is in good condition, but we humans can not keep up that pace, and quickly become tired and maybe careless. Carelessness with a chain saw can very quickly lead to tragedy, so beware, and be aware of yourself and when you need rest.

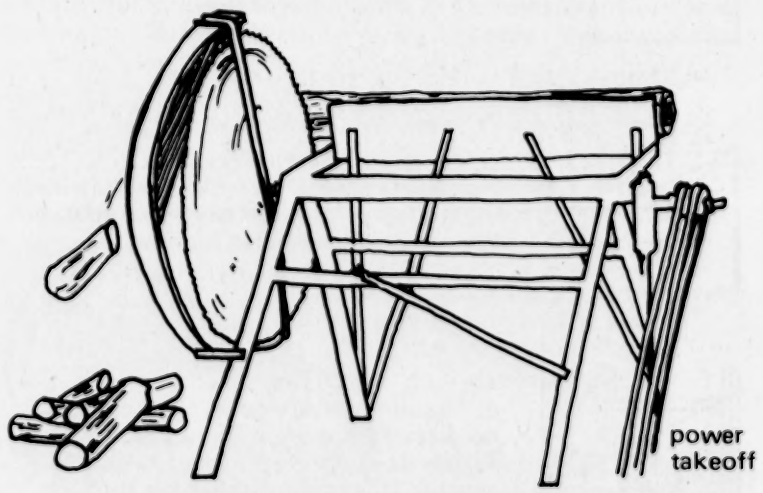
And do not overlook handsaws for limited wood cutting: a 2-man crosscut (you only exert "pull" force), a bow saw, and my favorite, the bucksaw. I have seen some nice homemade bucksaws which worked beautifully. See Fig. 9. Bucksaws consist of a 2" wide blade, about 2 - 4 feet long, stretched on a wooden frame with a turnbuckle for tightening the blade tension—— a real nice saw.

Double bitted axes are useful for gathering wood as well. One side of the axe can be filed with a narrow shoulder so it can be used for limbing. A sharp axe can shear a 2 - 4" limb in one blow (with some practice). The other edge of the axe can be used for either splitting or grubbing roots.

For large quantities of wood, I must admit that I think a chain saw is just too inefficient, and I now use a buzz-saw rig. Many farmers, before they converted to coal or oil heat, would cut their wood with buzz saws. I have even heard a story about neighbors who would cut their wood into 4-foot lengths with a 2-man crosscut and stack it by their house. Then they would hire a man with a steam-powered portable buzz saw rig to cut it up into stove length wood.

Fig. 9.





Buzz saw powered by stationary motor

A normal **buzz saw** has a 1" shaft (about 2 - 3 feet long) with several heavy duty pillow blocks mounted on a solid stand. On one end of the shaft is a 24" - 36" blade and on the other end a belt pulley. Usually the stand has a carriage on a track to hold the wood to be cut. The entire stand is usually weighted or staked to the ground to prevent it from moving during cutting. (Standard joke: "is your buzz saw running. . .?") The power source is usually provided by a farm tractor with a belt pulley PTO by a 8" - 10" wide canvas belt. Of course, the power source could also be a "jacked-up" car with a wheel removed, a water wheel, or other powerful stationary motor.

To operate a buzz saw efficiently requires about 2 - 6 people, but several days cutting will provide enough wood for most families for a winter. Here is an example of the way one might gather wood for the winter with the aid of:

1. several working people
2. one old farm tractor such as a Farmall H, John Deer, Case, etc. with a PTO belt pulley
3. an old trailer for hauling wood
4. one chain saw
5. an assortment of axes, handsaws, wedges, chains, chain binds
6. pick up truck or a wheelbarrow or cart

Several people thin out the woods or cut tops and such left from a clear-cutting operation. One person is using the chainsaw, while others are limbing branches from downed trees, marking them into 4 - 6 foot lengths, stacking them into the trailer, and clearing brush. The tractor can be used to haul tops or trees into a clearing for easier cutting. The four to six foot lengths are variable—— what you want is a piece of wood that one or two people can handle easily. Any tree over 18" diameter should be cut directly into stove length wood since larger pieces of that diameter are too unwieldy. The wood is then chained to the trailer, locked in place with a chain bind, brought back home, and stacked near the buzz saw. Make sure the area chosen has good drainage and accessibility in the fall wet weather since most cutting is usually done then. When you have stacked 5 - 10 full cord of wood, prepare for a buzzing day. You need at least 2 people in a crew and better 3 - 4 people. Here is the most efficient way I have seen the process run:

1. Prepare buzz saw: position it, weight or stake it down, sharpen the blade with a flat file, grease the pillow blocks and carriage tracks, line up the tractor perpendicular to the buzz saw, align the pulleys, attach belt, back up to tighten belt, and block wheels (blade rotates down toward you).

2. Stand back and test belt tightness by turning on PTO. Listen and look carefully. There should be a steady hum and whining of the blade; little rattling or flapping of the belt. Double check.

3. Get in positions: a. feed man - takes wood from stack and feeds it onto carriage; b. cutter - carefully guides wood through saw, brings carriage back to rest position; c. log retriever - catches cut log and heaves it into truck bed, cart, wheelbarrow, etc.

4. When there is a full load, stop PTO and saw, and drive wood to shelter to split and stack. This could be done with another 2 - 3 man crew, occasionally replacing the saw crew.

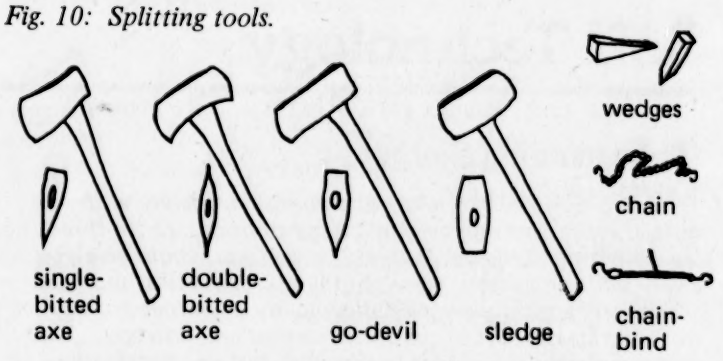
Other thoughts about the **buzz saw**:

1. The buzz saw is very efficient and very dangerous, be careful.

2. Don't use a blade with a crack in it or other imperfections, since the centrifugal force during its operation will tear it apart.

3. Keep the blade sharp and listen to its warning noises.

Fig. 10: Splitting tools.



4. Keep the shaft and bearing greased. An abrasive compound can be used on the belt to diminish slipping.

5. A weight or a spring on the carriage is useful to bring an automatic return to the precut position.

6. A buzz saw is a very useful tool that can be shared among several families or communes since it requires a lot of human labor and machinery to be efficient.

7. Old rigs can be found in most farmers junk piles for $10 - $25; new, I'm not sure where to get them except maybe from Gravelly. The Sears Catalog of 1907 reprint has some good pictures of them.

8. In rebuilding a rig be sure to make your stand sturdy. Use no less than 4" X 4" framework bolted together or weld 2" pipe together. It should be solid and heavy.

9. A buzz saw can also be used with jigs to crosscut beams or to sharpen fence posts.

10. Cover the rig when not in use to protect the metal working parts from rain.

On **splitting** wood:

Splitting wood is definitely an art that is refined with practice and the right tools. The necessary tools include: at least two metal wedges, a sledge hammer, an axe, and a go devil (a splitting maul). See Fig. 10. Protect handles of hammers and axes while you are developing your craft. Round handles can be protected with a 3" piece of plastic pipe slipped on before replacing head. Axes and go-devils can be protected with layers of rubber tubing wrapped around the handle with wire. Always use a chopping block to give you maximum splitting power and to prevent accidental blows into the ground or toward your body.

On **buying firewood** from the forestry service:

Check with your local forestry station if you live near a state or national forest. Contracts for firewood, fence posts, shingle billets, etc. are available at extremely reasonable prices. Also most logging companies leave a lot of wood (under a foot in diameter or tops and stumps) when they log through an area and that wood can be bought from the forestry service too. Prices in New York State were $1 a full cord for firewood. Most forestry services will also advise you about forestry management on your own land, and mark trees that you can thin for firewood or lumber. ■

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Havens, David. The Woodburner's Handbook. Media House, Portland, Maine, 1973.

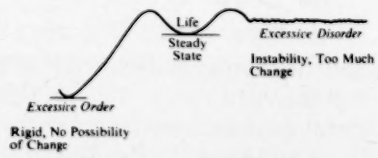
Soft Technology

Understanding energy

There are many new books concerning themselves with various aspects of energy and energy politics. These three are exceptionally good, and read as a group would give you a very wide and useful view. **Energetics, Kinetics, and Life** *gives the chemical view, and thoroughly examines biology from the standpoint of thermodynamics and entropy. The author assumes the reader is educated but not necessarily a scientist. The result is an unusually clear presentation of some rather difficult concepts. The same author nicely defines what he and several guest editors see as the major energy problems facing us today and in the future in* **Energy and Environment – Four Energy Crises**. *This material is covered from an academic viewpoint in a very tough-minded book* **World Energy Strategies**. *Facts and options coldly presented in what I find to be most useful manner, as it is unemotional and thus easier to personally assess. As I surface from reading these books, I can see that I've been pretty naive in some of my assumptions of what the big picture is. The subject is almost unbelievably complex as well as being critical, and it will be a long time before earth citizens can clearly see what must be done and how to do it. Books such as these start the educating process.*

–J. Baldwin

Energetics, Kinetics, and Life
(An Ecological Approach)
G. Tyler Miller, Jr.
1971; 360pp.
$6.95 postpaid
from:
Wadsworth Publishing Co.
10 Davis Dr.
Belmont, CA 94002
or Whole Earth



The First and Second Laws of Thermodynamics

First law: The energy of the system plus surroundings remains constant.

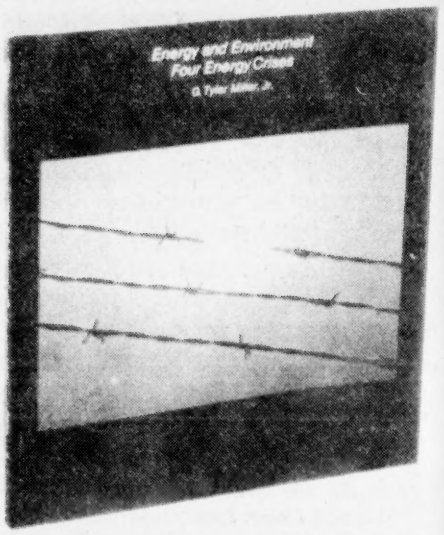
Second law: The entropy of the system plus surroundings increases for any spontaneous process.

•

The Laws of Thermodynamics

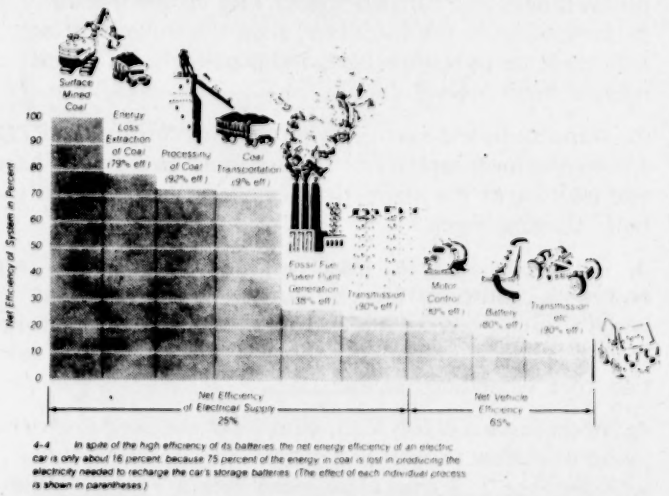
First Law: You can't get something for nothing.
Second Law: If you think things are mixed up now, just wait.

Energy and Environment: Four Energy Crises
G. Tyler Miller, Jr.
1975; 122pp.
$3.95 postpaid
from:
Wadsworth Pub. Co.
10 Davis Dr.
Belmont, CA 94002
or Whole Earth



Unfortunately, the term *spaceship earth* has meaning to most of us because we liken the earth to our man-made spacecrafts. But this is an upside-down view of reality. We should be considering not how the earth is like a spaceship but how a spaceship is like the earth. On our man-made spaceships every natural function can be performed only with the utmost deliberation and rigid control. There is little room for novelty, spontaneity, freedom, or most of the things that make life rich, vivid, or poignant. To survive on a man-made spaceship, everything must be programmed. Our lives would be managed and manipulated by experts, swathed in artificiality, and surrounded by gadgetry. How would you like to spend your entire lifetime on such a voyage?

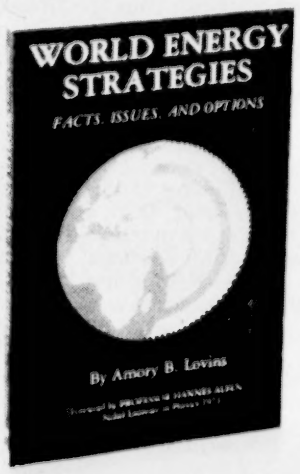
The term *earthmanship* as used in this book implies a world view and life style that goes beyond the useful but too restrictive spaceship view. Because we have had the spaceship image upside down, we have not cared about the real ship. Our task is not to pilot spaceship earth, not – as Teilhard de Chardin would have it – "to seize the tiller of the world." Instead we must stop trying to steer completely. Somehow we must tune our senses again to the beat of existence, sensing in nature fundamental rhythms we can trust even though we may never fully understand them. We must learn anew that we belong to the earth and not the earth to us. We must control nature to some extent, but we must do so with wisdom, care, and restraint.



4-4 In spite of the high efficiency of its batteries, the net energy efficiency of an electric car is only about 16 percent, because 75 percent of the energy in coal is lost in producing the electricity needed to recharge the car's storage batteries. (The effect of each individual process is shown in parentheses.)

World Energy Strategies
(Facts, Issues, and Options)
Amory B. Lovins
1975; 131pp.
$5.95 postpaid

from:
Friends of the Earth
Book Dept.
529 Commercial St.
San Francisco, CA 94111
or Whole Earth



People cannot choose options they do not know about. And though present energy shortages are disruptive because of ad-hocracy and outmoded values – not through any inherent impracticability of thinking twice as hard and using half as much – there is a danger that people may be persuaded by energy vendors that a three-day week in Britain, going without hot water in Stockholm, etc is a foretaste of life in a rationally planned low-energy economy, rather than of life in an increasingly vulnerable high-energy economy.

Connections

No leaf nor blade of grass stirs
In the moving zone between illumined
hemisphere and dark
A mockingbird sings
And we begin

Primordial chaos dense
Fierce heat brilliant light
Matrix of a universe compressed
Confining space in cramped infinity
Set free by times explosive birth

Grows cooler darker rarefied
Nebulae in turbulent surge and eddy
Swirling swarms of stars nuclear
Flames burning aeons then
To flicker out or
In one last conflagration
Spew their embers into space

Earth spins on its axis and
Round the sun while both
Wheel round the galactic hub
at half a million miles an hour

No leaf nor blade of grass stirs
In the moving zone between illumined
hemisphere and dark
A mockingbird sings
And we begin our daily round of failed
alchemy
Transmuting life to gold
We the ashes
of burned out stars

–Burton Lowe

From Know-How to Nowhere

A fascinating look at early technology in the USA and the men that brought it in. Their enthusiasms and faults are still with us today though in a somewhat less appropriate form. Mr. Morison hopes that a look at where we came from will help us understand what we have now well enough to permit better control and a more humane society. I think that books like this are important aids in our attempts to untangle the mess we seem to be in these days. There's more to it than politics and BTUs.

–J. Baldwin

From Know-How to Nowhere
Elting E. Morison
1974; 200pp.
$10.00 postpaid
from:
Basic Books Inc.
P.O. Box 4000
Scranton, PA 18501
or Whole Earth

What can be said of the achievement of these remarkable men? In quantitative terms – miles of canals and railroads, number of bridges, dams, and aqueducts, tons of iron, number of steam engines, mills, cookstoves, and sewing machines – the record for the first half of the last century is remarkable. The developing industrial plant astounded Europe and still seems astounding.

But there were other less impressive aspects of the case. Two seem worth some special mention. What was done was, often, not very well done. European observers frequently noticed the rudeness of our structures and the lack of what they called over and over again "the finish" of our products. For instance, our canals continued to leak, the roadbeds of our railways were badly ballasted and drained, our stoves were made of rough and often ill-fitting castings. As a case in point, the worst rail stock in England, the product used only for export, was called "American rail." And indeed our rails before the Civil War were never very good – they broke often under moderate use and wore out very quickly. As another case in point, an Englishman who was generous in his appraisal of our progress inspected the engine room of one of our celebrated river boats and vowed never to board another one of the vessels. Indeed, the statistics were all in his favor; the number of fatal explosions was a source of continuous comment, if not apparently of great concern.

A second condition that foreign observers often noticed was that beyond a point American engineering practice tended to stay the same. In the middle thirties, for instance, J. H. Stephenson came from England to get the evidence for a comprehensive report on the way we built and made things. Twenty-five years later, on the eve of the Civil War, a British colonel arrived on the same mission. Dutifully he compiled his findings and reported his conclusion that his trip had been unnecessary. What he had found was merely what his predecessor had discovered a quarter century earlier.

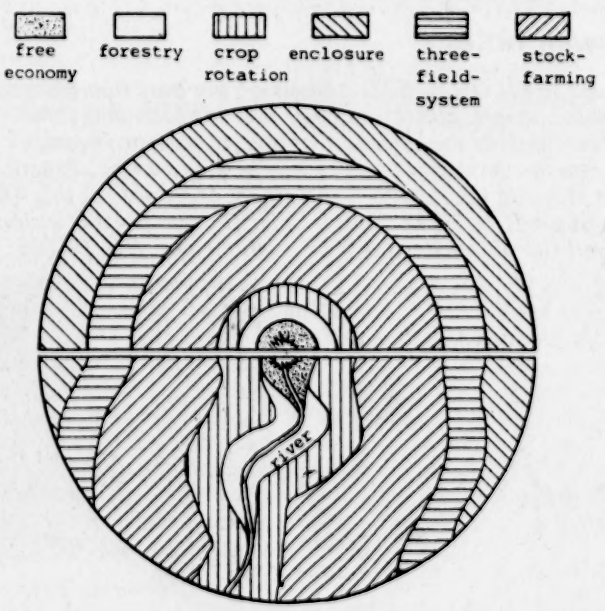
Low-energy economics

This is one of the most concise, easiest to see rationales for an "Intermediate Technology." A wide selection of authors and their ideas (e.g. Green Revolution) are criticized. A formidable annotation follows. This is a nice introduction to the subject.

–J. Baldwin

Toward a Low-Energy Development Concept for the Third World,
Document I/V 74/76
Urs Heierli
1974; 50pp
$1.50 postpaid
from:
CIDOC
APDO. 479
Cuernavaca, Mexico

To take up von Thünen's theory, a "bicycle city" would have to be supported by a self-sufficient agricultural system forming concentric zones around it up to a maximum radius of 30 kilometers (19 miles) or between 1 and 2 hours by bicycle. This gives an agricultural acreage of 3 million acres at most. Taking 1 acre as the minimum per capita food base, we get a maximum population density of 640 persons to the square mile. So the bicycle city could not exceed 300,000 inhabitants; leaving a certain margin for affluence, we could put the ideal figure for such a city at 100,000 inhabitants, with a further 100,000 employed in the surrounding agricultural support region. For developing countries a 1:1 ratio of agriculturally employed to total employed population represents a realistically employment-intensive target already today. With the help of intermediate technologies those 100,000 city-dwellers would almost certainly be capable of considerable economic and cultural achievements.



BRAD Solar Roof

Biotechnic Research and Development group in Wales has had a solar collecting roof successfully going for a year now in a so-so climate. The system is rather like that of the Harry Thomason house (EPILOG p. 533) and the plans are priced right though you'll have to translate trade names of materials into Americanese. Plans include electronic "black box" controller diagram. Nice folks too.

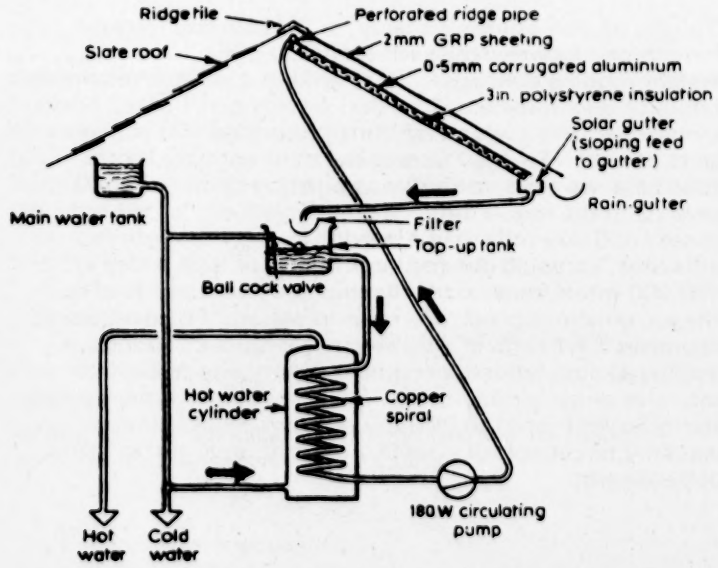
–J. Baldwin

BRAD's Solar Roof Plan

$1.00 postpaid (feel free to contribute more)

from:
BRAD
Eithin-y-Gaer
Churchstoke
Montgomery
Wales
U.K.

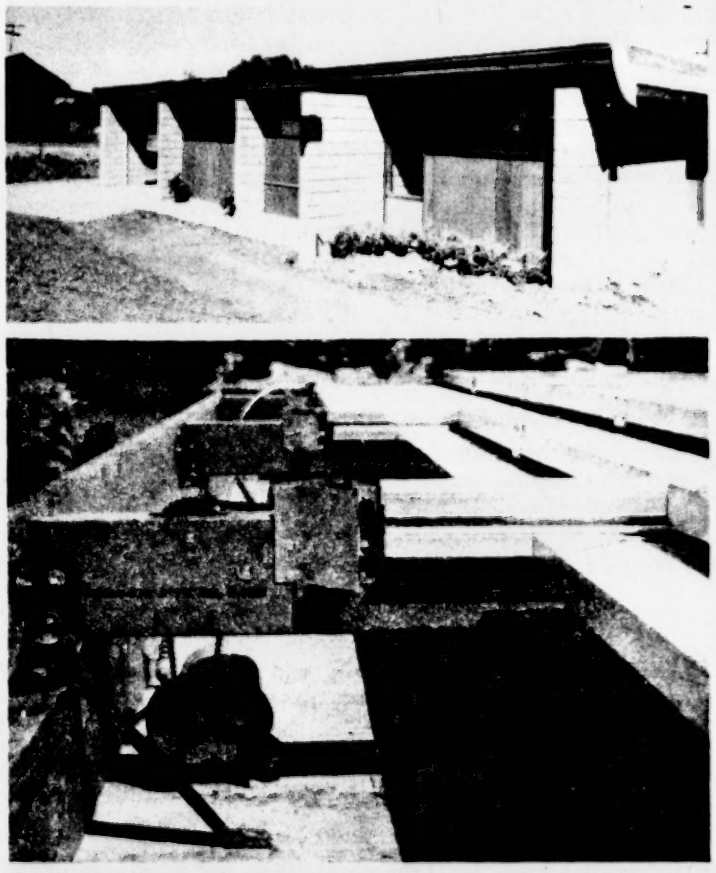
The plans themselves are being sold very cheaply, we feel; this is deliberate, since we are interested in spreading these ideas. They do contain all the info needed for complete do-it-yourself construction; our own solar roof, in a notorious Welsh climate at Lat 52½° North heats all the water for a community of about ten people (plus visitors) for about 6-8 months of the year; at other times it is used as a back-up, supplying pre-heated water to immersion heater and wood-fired stove.



Sky Therm

Harold Hay, one of the old pioneers of solar energy has at last finished and tested a real house utilizing his inventions. Basically, the idea consists of a large water bag built into the flat roof and covered with movable insulated lids. For heating, the lids are left open during the day and closed at night to store the energy which radiates downward into the house through the ceiling. For cooling, the lids are left shut during the day and the waterbags absorb heat from the house. At night the lids are open to allow the water to lose heat to the black night sky. It's simple, elegant, and now is proven and perfected. You can't buy one, as the idea is best suited to structures specially designed for the system. But Mr. Hay will consult for a suitable fee. Franchises available.

Sky Therm
2424 Wilshire Blvd.
Los Angeles, CA 90057



Small motor runs 3 minutes morning and night to move panels; automatic controls with thermostat setting (or manual).

Kalwall notes

Kalwall (EPILOG p. 532) makers of the best fiberglass solar collector covers, continues their fine attitude and solar pioneering with the addition of several new products, a free newsletter describing them, and a new book, **Practical Solar Heating Ideas With Sun-Lite.** *For a copy of this 46-page booklet, send $2.50 to: Solar Components Division, Kalwall Corporation, Box 237, Manchester, NH 03105*

Sundu Solar Heater

We're still not advocating any particular solar heaters, and what with the wild proliferation of manufacturers and schemes we aren't even going to list new ones unless they are of a new type and are proven. But these people have a nice idea: they'll send you a 1½ ft. by 3 ft. piece of their plastic solar panel plumbed and ready to test. A nice idea, we think, and a cheap way to get a feel for the subject.

– J. Baldwin

Sundu Solar Heater Model
$12.00

from:
The Sundu Co.
3319 Keys Lane
Anaheim, CA 92804

Compendium

Compendium Booksellers publishes a catalog of Ecology, Self Sufficiency, Environment and Alternative Technology books, free. Send postage for the list. They have comprehensive lists on other subjects as well. This is one of the best ways to see what's in print in Europe and other places outside USA.

—J. Baldwin

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from:
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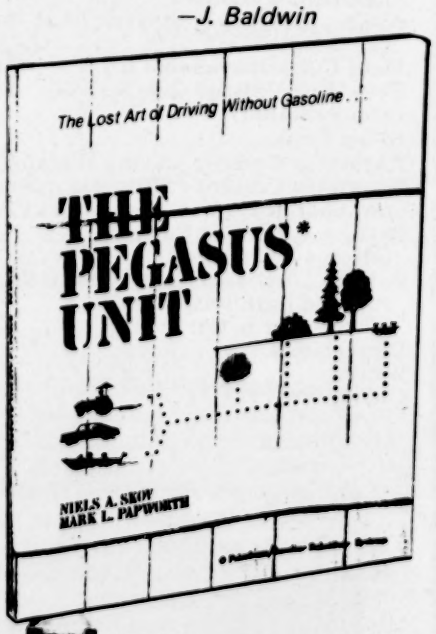
240 Camden High St.
London NW1
England

The Pegasus Unit

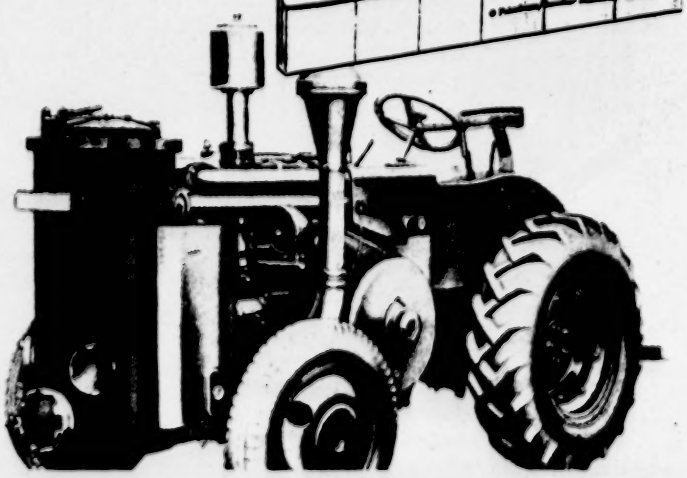
During World War 2 many Europeans circumvented the fuel shortage by equipping their vehicles with charcoal devices that made a crude gas. They were not very good devices and caused plenty of trouble with fires, asphixiation, and mechanical failure, but the people did drive. A professor and some students at Evergreen State College have been working on a modern version which hopefully will burn garbage or other waste materials such as the wood scraps that are now burnt in those "Tipi" furnaces at sawmills. Their investigations so far have resulted in this book, which offers a documented history and theory of the device. Lots of pictures and diagrams explain the principles and technical details. I personally doubt if it's a practical idea, but Pegasus is certainly interesting. (A complete set of engineering drawings and operating instructions is available to allow the construction of a Pegasus unit suitable for operation with present gasoline and diesel engines and may be ordered from: Pegasus, Inc., P.O. Box 121, Olympia, WA 98507, $22.50.)

—J. Baldwin

The Pegasus Unit
Neils A. Skov and
Mark L. Papworth
1974; 133pp.
$7.30 postpaid
from:
Bookstore
The Evergreen
State College
Olympia, WA 98505
or Whole Earth



Pegasus fueled farm tractor.

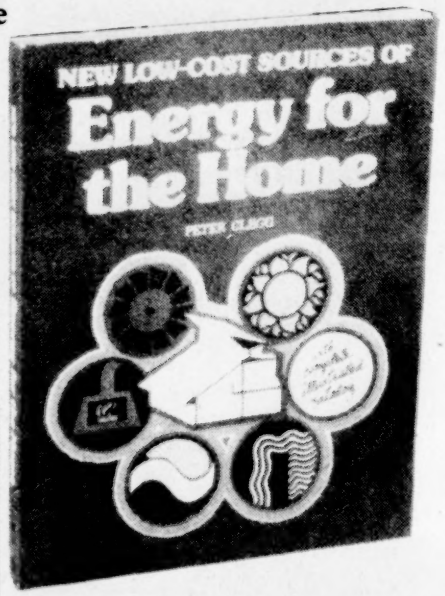


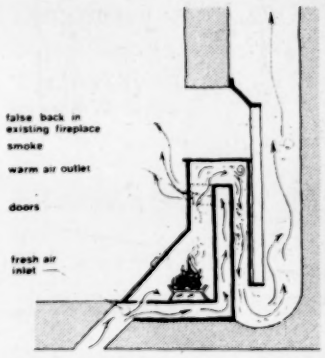
Another energy book

Garden Way gets into the act with this fat book that's sort of in between the lesser overview books and the **Energy Primer.** *Has catalog sheets on some lesser known equipment not shown in other publications. Very good photos printed on nice paper. You might at least look at it.*

—J. Baldwin

New Low-Cost Sources of Energy for the Home
Peter Clegg
1975; 252pp.
$5.95 postpaid
from:
Garden Way Pub.
Charlotte, VT 05445
or Whole Earth





Ben Franklin's original 1742 "Pennsylvania Stove." Modern "Franklin stoves" are much less efficient.

NTIS on solar energy

The United States Technical Information Service comes through with this massive document reviewing recent developments and future planning in solar engineering. Most of the domestic projects are already well enough shown in other publications, but the value of this book is in its coverage of foreign developments, particularly in the USSR. There is also a fair amount of crude third world solar technology shown (e.g. fruit drying). This is a reference book, and as such you should be able to get your local library to obtain it.

—J. Baldwin

Solar Energy
AD-778, 846
Vlastimir A. Stevovich
1974; 441pp. (xerox)
$12.00 postpaid
from:
U.S. Department of Commerce
Box 1553
Springfield, VA 22151

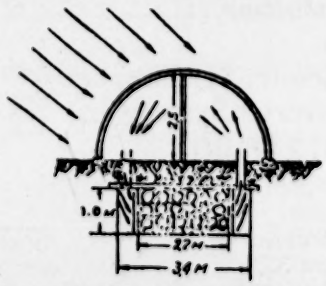


Fig. 176. Schematic of a semicylindrical greenhouse with a solar heat storage, USSR.

During 1967-1972 the Physicotechnical Institute of the Uzbek Academy of Sciences jointly with the State Pedagogical Institute, Karshi, Uzbek SSR, conducted extensive research on temperature regimes in a semicylindrical greenhouse both with and without solar heat storage. The form and dimensions of this greenhouse (Fig. 176) are the same of that in Fig 175, except for the added solar heat storage compartment filled with pebbles (10-15 cm in diameter) as heat accumulators with specific weight of 2500 kg/m^3 and a thermal capacity of 0.22 kkal/kg/degree. The heat storage compartment has a total volume of 88 m^3 and is about 55% filled with pebbles. The greenhouse was covered by a double polyethylene film (350 m^2) over a growing area of 200 m^2, with inside solar radiation capacity ranging between 490,000 and 500,000 kkal/day.

Windpower Digest

We noted the existence of this publication in the last **CQ**. *The first issue wasn't much, but more was promised next issue. Next issue is here and is just fine. Those seriously into wind power will be pleased with the latest news and especially with information on restoring old machines. Plans too. And the editors have given the magazine a good "feeling" that makes it a pleasure to read.*

—J. Baldwin

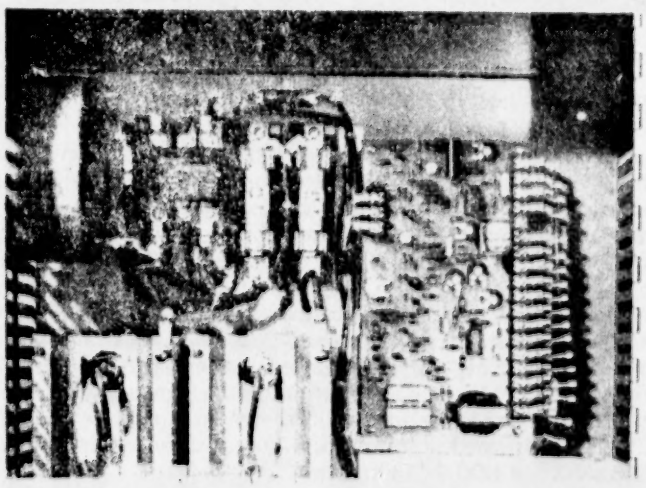
WindPower Digest
Michael Evans, Ed.
$6.00 (4 issues)
from:
WindPower Digest
54468 CR 31
Bristol, IN 46507

Gemini Synchronous Inverter

Windworks is selling this device which takes variable-voltage DC current (as from a wind generator) and converts it to household AC as needed. If the wind machine is making more than you need, the excess is put into the local power company's grid for "storage." If the wind isn't keeping up with your demands, then the extra needed is made up by taking it from the power company in the usual way. Nice. It avoids batteries or other storage systems, and makes the generator very efficient. Not explained is how the power company will adjust your bill. Also not indicated is the net energy advantage, if any, of such a system. The economics are not so clear either. Nonetheless, it's a good start towards actually trying an interesting concept, and a properly sized system might show some real advantages.

—J. Baldwin

Gemini Synchronous Inverter Systems
$1275.00
for 8KW model
from:
Windworks
Box 329
Mukwonago, WI 53149



Wooden wind-generator blades

For those of you interested in making or restoring wind machines, here's a place that makes blades, and at a reasonable price too. Your choice of Douglas Fir or Sitka Spruce (for harsh conditions); one piece 2 blade, or separate blades for multiblade set ups. All balanced and with a 3 year guarantee. A way to save much hassle.

—J. Baldwin

5 to 10 ft. diameter
$25.00 - $60.00
from:
Aero Power Research Co.
P.O. Box 2001
Burlingame, CA 94010

Watchman Regulator

For wind and water generators, a suitable voltage regulator has been difficult to come by. This one has the unique feature of allowing a machine to freewheel in a slight wind to get up speed before charging. This allows some charging in very light airs. It also does away with the switch that alternators need to sense the wind so they can turn on. Expensive, but it apparently works. Comes as a kit too for less money. We'd like to hear from users.

—J. Baldwin

Watchman Regulator
$64.00 - $99.00
from:
Earle Engineering
Box 850
Alpine, CA 92001

SPECIFICATIONS

Alternator Output Current (that the regulator can handle)	70 Amp Max
Field Current available from regulator	4.5 Amp Max
Regulator Voltage (temperature compensated)	14 Volts, ± 2%
Delay Time	20 Sec (typ)
Regulator Current (during charging)	0.1 Amp (typ)
Regulator Current (with field open, not charging)	0.0025 Amp (typ)
Battery Discharge Current (alternator stopped)	0.035 Amp (typ)
Battery Discharge Time (alternator stopped indefinitely with 80 Amp/hr battery)	3 months
Dimensions	4½ x 5¼ x 3½ ins.
Weight	2 lbs.
Guarantee	1 Year

Regulator Model 1270B

Drafting Technology & Practice

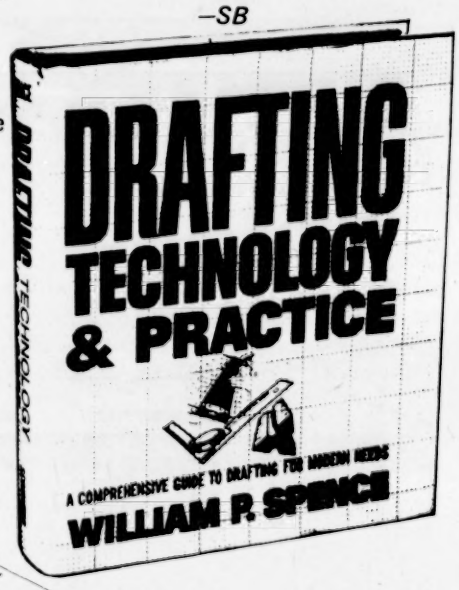
Drafting is the language you speak to the person who is going to have to make your idea. There are formalities. But it also is an art, especially when the idea is not easily explained. "Drawing it up" also tends to make the inventor more honest both with the rest of the world and himself. This book must be the clearest I've ever seen on the subject. So clear that it makes you think clearly. You couldn't ask for more. Mapping, technical illustrating, and electronic diagramming are also covered, along with just about anything else you could think of.

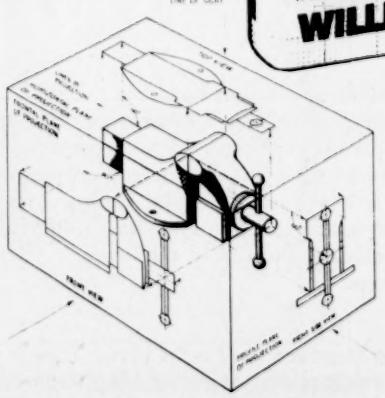
—J. Baldwin

I wish to hell the makers of home-made how-to books would attend to this text.

—SB

Drafting Technology & Practice
(A Comprehensive Guide to Drafting for Modern Needs)
William P. Spence
1973; 814 pp.
$18.00 postpaid
from:
Charles Scribner's Sons
Vreeland Ave.
Totowa, NJ 07512
or Whole Earth



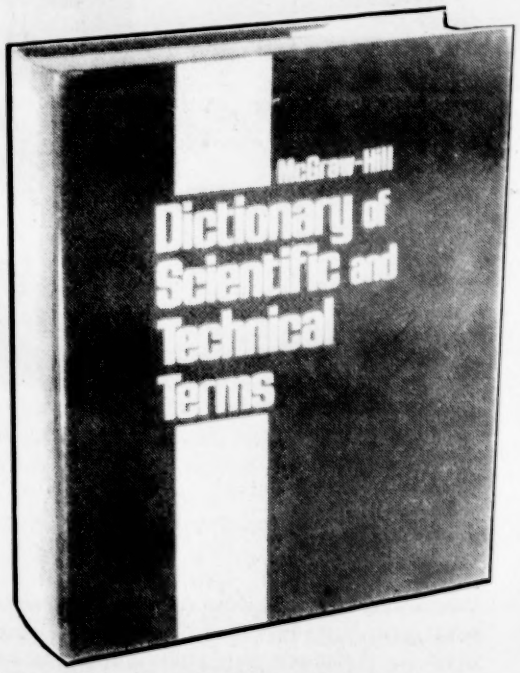


Dictionary of Scientific and Technical Terms

As technology becomes more complex, the language involved is increasingly laced with specialized words. Webster's isn't much help with these. McGraw Hill's is. As might be expected, you sometimes have to look up the words in the given definition too before you get the meaning e.g. "restiform body See inferior cerebellar peduncle." Generally, though, the book is concise, clear, well illustrated, and easy to read. The discipline generating the word is indicated which makes it easy to tell where you can find out more about the subject in the definition. And the range of subject matter just has to be seen to be believed! Even as a technocrat, I've never before felt so strongly the immensity of technology. Insist your library get one.

—J. Baldwin

McGraw-Hill Dictionary of Scientific and Technical Terms
Daniel N. Lapedes, Ed.
1974; 1660pp.
$39.50 postpaid
from:
McGraw-Hill Book Co.
c/o Trade Order Service Dept.
Princeton Road
Hightstown, NJ 08520
or Whole Earth



Lagrangian points [ASTRON] In planetary orbits, two positions in which the motion of a body of negligible mass (such as an asteroid) is stable under the gravitational influence of two other bodies (such as the sun and Jupiter), one of which is moving about the other in an approximately circular orbit; the two positions are located on the orbit, 60° ahead of or behind the orbiting body so that the three bodies form an equilateral triangle.

Steam engines

Dear Sisters & Brothers,

I was rather surprised to not find Cole's Power Models, Box 778 Ventura, CA 93001, listed in either the Last Catalog or Epilog. This little backyard operation has been around for nearly half a century and their products are of superb quality, the service excellent. They handle the same line of Stuart-Turner steam and gasoline engines that Caldwell Industries (Epilog) handles but more complete in addition to many other models, a steam powered bycyle, and a wide variety of hard-to-find metals in various shapes, and small tools. In the 20 years of off and on business i've done with them, i've no complaint. They publish a beautiful catalog (No. 22) at $2.25. . . .

Day-Land Steam Engine

This is an updated version of an early automotive engine designed by Ralph Day and the late Arnie Land, now handled by Bill Moore, who is the current president of the Steam Power Club. It is 2 cyl. d.a. rated 20 h.p. @ 1200 r.p.m. on 600 p.s.i. Available with D-slide or Clarkson valves in an unmachined casting set only at $168 - $217.

While i've not seen this engine, Bill has sent me the data sheet and engineering drawings and the design looks sound. The only other engine of this size currently available is the Semple 10 h.p. at $726 in an unmachined kit.

Chris Ward
Folsom Prison
Represa, California

Coles' Power Models
Catalog No. 22
$2.25 postpaid
from:
Coles' Power Models
Box 788
Ventura, CA 93001

"Vesuvius," a steam powered bicycle. (Bore: 1-3/8", stroke: 1-1/2", boiler fuel: gasoline, working pressure: 100 psi, top speed: 16 mph.) This steam bicycle power unit may be attached to any bicycle or tri-wheeler with a 24-27 wheel diameter. No modification required. The front wheel mounting allows the rider to view the pulsating engine and keep an eye on the water level. The unit does not interfere with pedals, which may be used when extra power is needed. $70.00 25 page folder: plans, parts lists, instructions, history, $18.00.

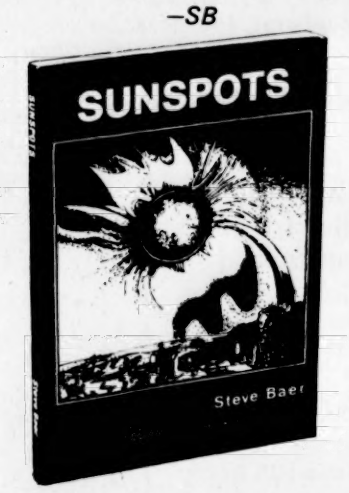
Sunspots

This is the deepest of Steve Baer's works and also the most crisply presented. Here is accummulated the experience of Zomeworks' ten years of successful experimentation, design, and delivery of solar energy systems. All that richly blended with Steve's J. G. Ballard-type fantasies (printed as "Energy Stories" in the Spring '75 CQ) and his acerbic criticism of federal energy studies, modern engineering text literary style, and the like.

If a real philosopher were a real engineer, he would write like this.

—SB

Sunspots
Steve Baer
1975; 115pp.
$3.00 postpaid
from:
Zomeworks Corporation
P.O. Box 712
Albuquerque, NM 87103
or Whole Earth



A house is a shade sandwich — the roof on one side, the earth on the other.

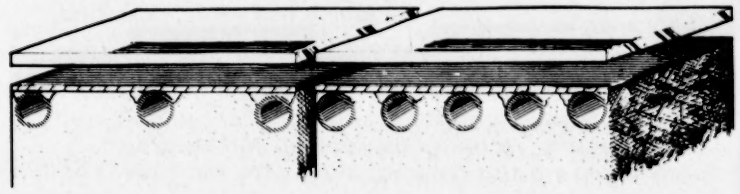
•

When you are designing something it is important to know what you must be careful about and where you needn't be careful. Rafts are extremely simple to build. You can add anything you want — so long as it will float.

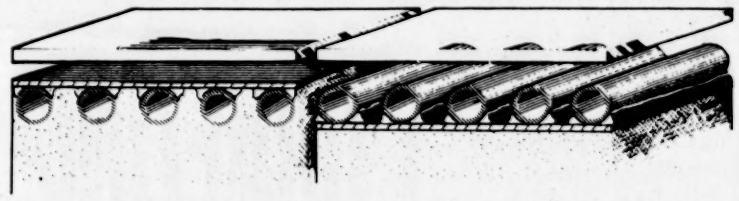
Bridges are not like rafts; enough weight added in the wrong place can break the bridge. Building a heat conductor is more like building a raft than a bridge. Anything added in parallel to a path along which heat is being conducted is an aid to the transport of the heat. So that in fabricating a heat exchanger, if you had some scraps of metal left over, you might just solder or weld them on the exchanger rather than throw them away.

SOME COLLECTOR COMPARISIONS

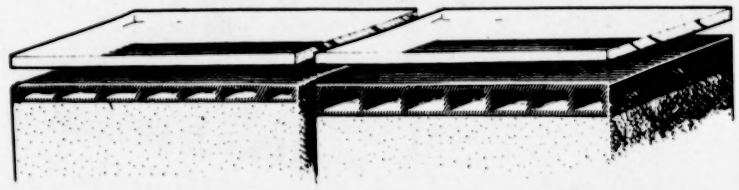
(Note: all drawings are cross sections.)



(1) and (2): (2) is better than (1) because the tubes are more frequent and the heat does not have so far to travel to reach the liquid.



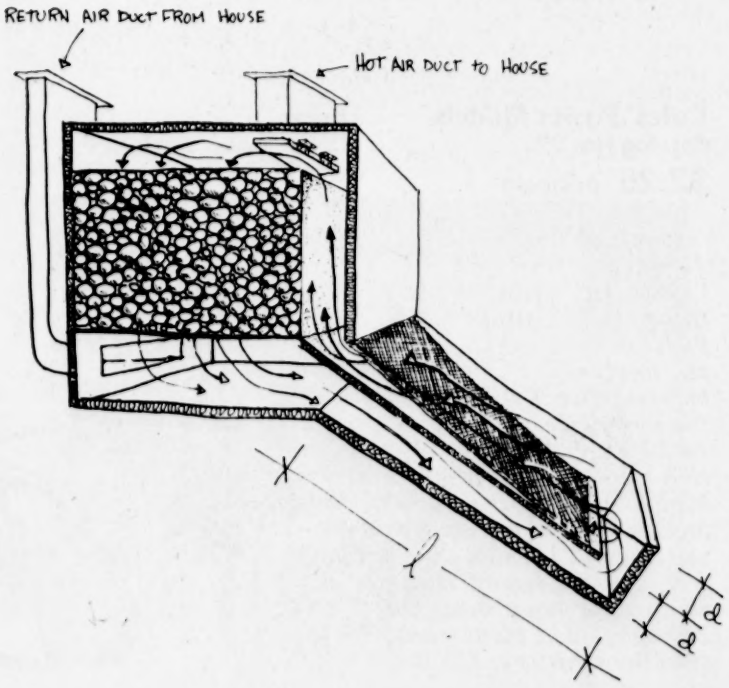
(2) & (3) - (3) is better than (2) since the tubes in this case are placed in front, directly in the sun, and thus some of the heat needn't take the detour through the plate.



(9) & (10) - Generally (9) will be a better collector than (10). This is because collectors grow cold or fall asleep when the sun goes behind a cloud or during the night. A heavy collector with a large mass of water has a great deal of heat to lose as it assumes the temperature of the air around it. Then when the sun comes up it takes a long time to wake up, for its mass must be warmed up above the useful collecting temperature before you circulate the liquid through it.

•

You can take comfort in the fact that heat is not clever. It does not invent new ways to move; it cannot leapfrog barriers. It is always predictable.



Air loop, rock storage
solar heat systems
DESIGN TIPS

1. *Make d = at least 1/15 L.*
2. *Make roaks (h) 2 feet deep if small gravel (1") and up to 4 feet deep if large rock (6").*
3. *Make collector slant at least 45°.*
4. *Insulate storage box with at least 6 inch batt.*
5. *Make collector at least 6 feet long.*
6. *Keep all flow channels at least 1/15 of collector area.*
7. *Avoid corners in flow channels.*
8. *Make storage cross section at least 2/3 of collector area.*
9. *Insulate divide between down flow and up flow with at least 1 inch duct board.*
10. *Double glaze collectors if 7000 degree day climate or more.*
11. *Hand place rock if possible to avoid layers of dirt in bin.*
12. *Place all of storage rocks above collector.*
13. *Build house above storage bin.*
14. *Build vent flap at top of collector to open during summer to prevent overheating.*
15. *Heat house with trap door to rock bin and duct to cold under for return air.*

(Most of these rules are probably too strict while some may not be strict enough.)

Craft

Patterns for Guernseys, Jerseys & Arans

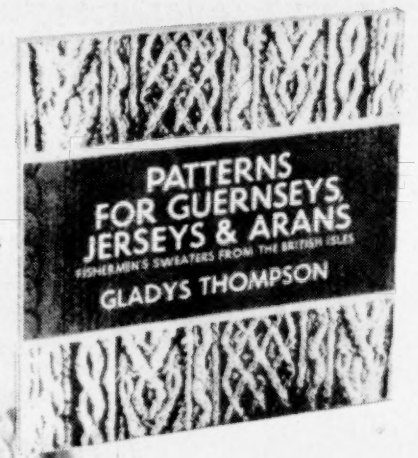
An obscure book on knitting I use often, and which seems to be borrowed from me frequently. These sweaters take a long time to make, but one should be sufficient for most of a lifetime. Owning one gives you an incredible sense of security.

—Gail Temple

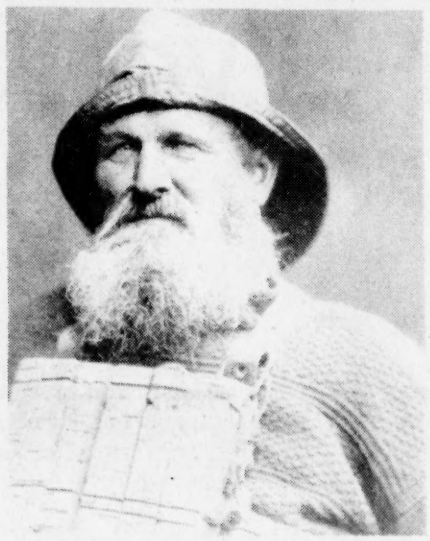
Full knitting instructions are given for some of the sweaters but only for the pattern blocks for some of the more complex types, such as the arans.

—Diana Sloat

Patterns for Guernseys, Jerseys & Arans
Gladys Thompson
1971; 162pp.
$3.00 postpaid
from:
Dover Publications, Inc.
180 Varick St.
New York, NY 10014
or Whole Earth



A fisherman's guernsey in cable and cross-over patterns



Harry Freeman, only survivor of Whitby lifeboat disaster 1881.

'The complicated designs on fisherman's dark-blue jerseys round the British coast are not just haphazard, or worked in from whim. The Symbols have conveyed messages for several hundred years. In the Hebrides, for instance, the fishermen wear jerseys with a distinctive yoke.

The fancy is that the yoke represents the house or home. In the middle is an open diamond, representing a window. If the diamond has a heart inside it, that means 'the heart is in the home'. Closed diamonds, or 'nets', flank the central design with a double plait, meaning 'hoof prints in the sand'.

The yoke of the Hebrides jersey is defined by several rows of purl knitting, called 'poor man's wealth' – because it is so difficult to count. 'Steps' (to the house) lead up the middle of the lower part of the jersey. Double zigzags mean 'marriage lines' (ups and downs) and parallel zigzags the waves on which the fishermen sail. The double moss stitch panels represent 'sands'.

Columbine Spinning Wheel

Dump tradition — it's a sweet piece of equipment: 2-speed whorl; large bobbin (7"), eye and leader-hooks for spinning fat yarns; very easy smooth treadling; simple tension adjustment; light and highly portable (no loose pieces dropping off while carrying). Metal frame is painted bright orange, no less, and the price is right. Friends who use it swear by it, and I like its feel.

—Diana Sloat

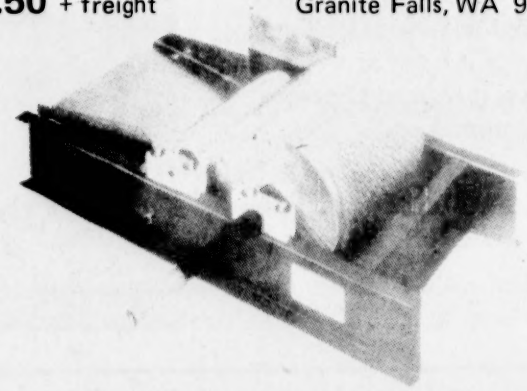
The Columbine Spinning Wheel
$115 + freight
from:
Columbine Machine Shop
1835 So. Acoma St.
Denver, CO 80223

Fricke Carding Machine

Curtis Fricke's magic carding machine — "instant" fleece carding for worsted spinning (fibers combed parallel to each other). Heavy metal construction with steel spines set in leather backing at about 16 per inch. Generally doesn't "walk" as you use it, though it's designed for anchoring to table with C-clamps. Crank has a revolving hand grip in contrast to the Canadian carder (LWEC p. 166) which blisters your palms. If you don't expect it to comb quite finely or to magically remove burs and foxtails, you'll find it an efficient machine.

—Diana Sloat

Fricke Carding Machine
$79.50 + freight
from:
Curtis Fricke
Route 1, Box 143
Granite Falls, WA 98252



Working In China

BY ORVILLE SCHELL

Self-introduction:

Orville Schell recently returned from an unusual nine week work trip to China. The trip was arranged by an American family with close and friendly contacts with various high ranking Chinese leaders. One of the first of its kind, the group worked on a rural farm work brigade for three weeks, in a Shanghai electrical machinery factory for two weeks, and toured China from North to South for the remaining weeks.

He reports that his trip was "incredibly exciting and interesting." He was deeply impressed with the energy and progress which the Chinese have been making on almost every front. He mentions also certain aspects of China which were both "unsettling," and "difficult to adjust to for a hopelessly individualistic western reprobate."

He is presently at work on a long series of magazine articles about the trip and a book to be published by Random House.

Orville prepared the definitive "Access to China" section in the WHOLE EARTH EPILOG (pp. 626 - 633). He is co-author of Modern China *(1972; Random House). His brother Jonathan Schell has been a regular contributor to* The New Yorker *on Vietnam.*

—SB

Three Women

"Do you want to get married?"

"Oh, yes."

"When?"

"Not until about 27. Now is the time we are strongest, and we want to concentrate on building socialism."

"Why do you want to get married?"

There is a pause. Then, "Well, to have children."

"How many do you hope to have?"

"Two, as suggested by the Party."

"Do Chinese enjoy sex?"

Long pause. A married woman answers. "Yes, of course. But we do not talk about it all the time. And it is not appropriate to discuss it in front of people who are unmarried."

Master Chang and Me

Each day I work with Master Chang laying copper coils into large D.C. electric motors at the Shanghai Electric Motor Factory. We arise at six, begin the work day at 7:00, have an hour for lunch in the factory canteen at 10:45, return to work until 3:00. In the evening there are study groups, sports, evening classes or time to be alone with your family. Workers usually retire around 9:00.

The work pace in the shops is very relaxed. There is no frenzy, no complaining and little of the tension which surrounds most American workers. There is always time to stop and chat. It is not uncommon to see people standing now and again in small groups around the floor of the shop talking and smiling. Since each worker sees his piece of equipment through many stages of production (both manual and automated), there is no assembly line pressure. Master Chang works slowly and thoroughly. Rather than work fast, most workers do extra volunteer time in the shop without pay.

Leading cadres (equivalent to our management and executives) work in the shops along side of us. When they pass by, no one stops talking, speeds up or tries to look industrious.

One thing which impresses me immensely, is the absence of the old jam and crash syndrome; work hard and kill oneself in order to get more time off for leisure at night, on week-ends or vacations. In fact, there seems to be little or no concept of leisure in China. Workers and peasants do not make a sharp distinction between work and pleasure. Moments of relaxation and conviviality are mixed right into the flow of the average day. Work and play seem to be so well fused together, that it is hard to even elicit a recognition that there might be a distinction.

Never do I hear workers sitting around and discussing or grumbling over how much or how little they were making.

Brain Surgery

Scalpels quickly cut along the cross marked on her forehead. The patient is a woman worker from Hunan who has been sent to Shanghai to have a tumor removed from the area of her pituitary gland.

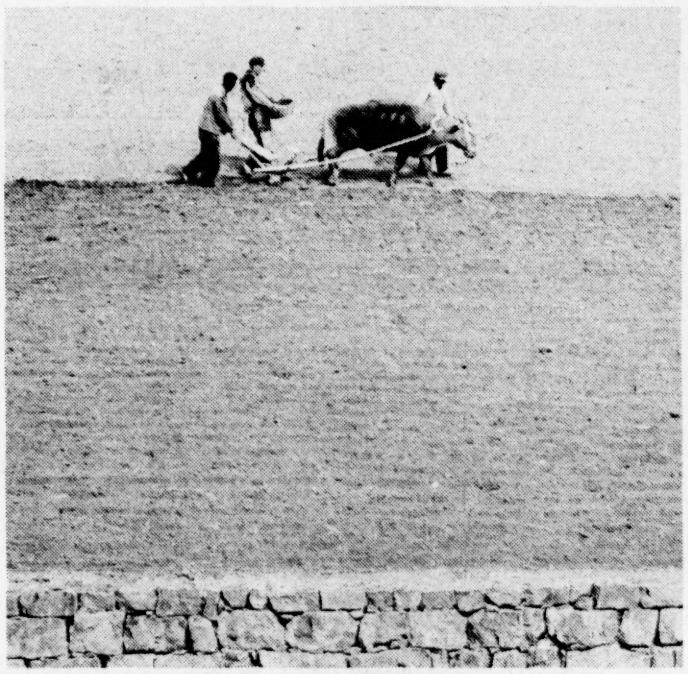
The cut flesh bleeds profusely. The scalp is peeled back like a mango skin and clamped with hemostats. The blood is sucked away with vacuum hoses.

One of the neuro-surgeons takes a brace and bit-like surgical instrument, and commences to drill four holes through her skull. A two inch square piece of bone is cut out with a wire surgical saw, exposing the woman's naked brain below. The doctors move with deft precision.

As the operating team reaches into this ragged red square aperture towards the tumor pressing against her pituitary gland, a nurse brings in a dish of peeled slices of apple for the patient to eat if she becomes hungry. The American polygraph monitoring her body functions shows all normal. There are no problems of depressed functions associated with more familiar kinds of anasthesia. The patient is being relieved of pain through acupuncture; through needles inserted in her feet and brow which are charged with a slight electrical impulse.

The patient is fully conscious as the operation proceeds. She is capable of eating. As the surgery advances, the doctors speak with her, sketch her in on their progress, reassure her.

In three hours the operation is near completion. The bone is replaced, and the various levels of tissue sutured back together. Her head is bandaged. As she is wheeled out of the operating room, she waves good-bye to us, and says, "Thank you for coming."



Terraces

In the rugged Taihang mountains in Shensi Province, almost every field has been hand cut out of the steep mountain sides. In the past, heavy rains have been the sorrow of the Chinese peasant, washing fields and crops down into the river beds.

During the last 15 years the peasantry have begun stronger and well crafted terraces and water works out of stone. The stone blocks are laboriously chipped by hand from quarries. One village, Shih Ping, in Hsi Yang County, has hewn some 14,000 cubic yards of rock into blocks to build underground irrigation tunnels and cisterns of over 7,000 yards. The tunnels are 12 feet high, 16 feet wide, and are some of the finest masonry since Roman times.

The villagers figure that a good mason can hew 40 blocks a day. There are approximately 27 blocks in a cubic yard.

This village of 480 households, hewed 378,000 blocks in five years for their reclamation work. Each stone block was then carried and placed by hand.

Three little boys

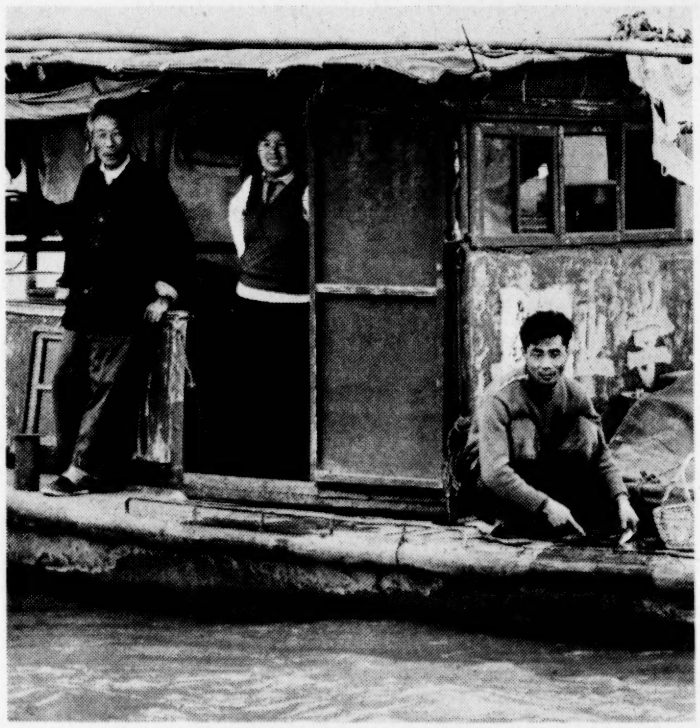
Question: "What do you want to be when you grow up.

Answers:

"Anything the Party needs."

"I want to serve the people."

"I want to join the People's Liberation Army and get the bad guys."



Fish Commune

"Our Commune is almost all water. We used to all be poor fishermen who lived on their boats and had to even rent the water from local despots in order to fish. It was a hard poor life. We had a local saying about fishermen who never had a house and never could take a bath. We said, They are so poor and smelly, 'that when a fisherman passed a gate, the cat would follow him for 3 li.'

"Now, we actually raise fish. Through the years we have learned to use fish culture as our main line, but also to cultivate complementary sideline enterprises. For instance, our commune raises minks, chickens, and pigs at the same time. As it turns out, chickens love to eat mink droppings, pigs love chicken shit, fish love pig shit, and then in turn, the mink love fish heads and guts. Then, in our fish breeding ponds we cultivate three separate layers of fish. The top fish eat the pig shit, the middle level fish eat the waste from the top level fish, and the bottom fish are suckers, and eat anything that comes their way. It works out quite well. Chairman Mao teaches that bad things can be made into good things."

Blind Worker

The Shanghai No. 2 Low Voltage Electrical Appliance Factory is run by 450 workers. 120 are blind, 80 are deaf mutes, 40 are crippled.

An older worker, Comrade Lou, blinks her lids over pale empty sockets, and speaks.

"I lost my sight at 15 because of an eye disease. We did not have the money to see a doctor. What could I do? I had to become a fortune teller, to deceive people to make a living. But I had no other way out. Not only did I not have enough to wear and eat, and had no place but the street upon which to sleep, but rich people looked down on me and hooligans beat me up.

"Before liberation, the hardest time for the blind was the winter. I don't know how many of us blind died in the streets . . . just froze to death."

Dance troupe

I ask Shih Cheng-hui to open her mouth. She waves me off in embarrassment.

"Wider," I say!

I get a quick look. She has no cavities.

"Do Chinese children have a lot of cavities," I ask?

"No," she says. "Maybe some of the older peasants or children in backward areas have some. But now we are all very conscious of how we take care of our teeth. There are posters everywhere telling children, and adults, how to brush them, use tooth picks and not drink things which are too hot or cold." (The Chinese have some of the finest tooth picks in the world, made out of sturdy, slender, durable rattan [bamboo]).

"Do children like to eat candy?"

"Of course. But they can not eat it all the time."

"Do they get allowances to spend themselves?"

"Well, first they must learn how to spend money wisely. And they do not get money until they can work. Their parents will buy things for them. Otherwise, they would just go out and spend it wantonly on candy and toys. Besides, you know, candy is not cheap here in China, and the children eat almost no sugar in their food, so their mouths are not always watering for candy the way I think yours does."

Dock Worker, Liu Fu-chu

"In the old days on the docks before liberation, we used to unload a lot of coal carrying it on our backs. Sometimes a coolie (in Chinese, literally, Ku-li, "bitter work") would slip and fall off the gang plank. Maybe he would seriously injure himself or be killed. And you know what? When someone fell, the foreman would run over and get mad!

"I had a friend who once fell. We hurried over to help him. Then the foreman came, and saw that he was dead.

" 'Get to work,' he said! 'What does it matter if there is one less coolie? With one call we can get 100 more!'

"So, we used to say about old Shanghai, that if you were looking for 100 dogs, it would not be easy to find them. But if you were looking for 100 coolies, there was no problem."

Death

"Funerals have changed now," says Lao Geng tilting back in his chair and rocking to and fro.

"When people die in the countryside now, it is quite simple. Yes, there is grief. But it is not like the old days with all the sacrifices, ceremonies and big expenses that drove many peasants to ruin.

"My father passed away last year. He was just a poor peasant. He worked all his life for this landlord. But at least he had his old age after liberation. Anyway, we buried him. In the countryside we peasants still don't like to cremate the dead like in the cities. There is still a little bit of conservatism, even superstition. We aren't used to the new ideas, and just don't like seeing our relatives burned up.

"In this town we usually call a town meeting. We dress the dead in new clothes and lay them out on a pallet. After a short gathering, where friends speak a few words of praise, the body is taken to the hills to an arranged place and buried in a small cave dug out of the earthen cliff-side. The family usually follows along carrying brightly colored paper wreathes which they leave at the burial place. But nothing expensive. We don't even use coffins. Maybe in some other places they do. But not here. In fact, after the body is placed in the cave, the wooden pallet is taken back and saved. Then the cave is sealed with stones and earth.

"In the old days we used to have family plots right out in the middle of good fields because of superstitions about geomancy. But not now. That wastes good land. Now, no one even spends much money. It is discouraged.

"Well, that's the way it is now in China."

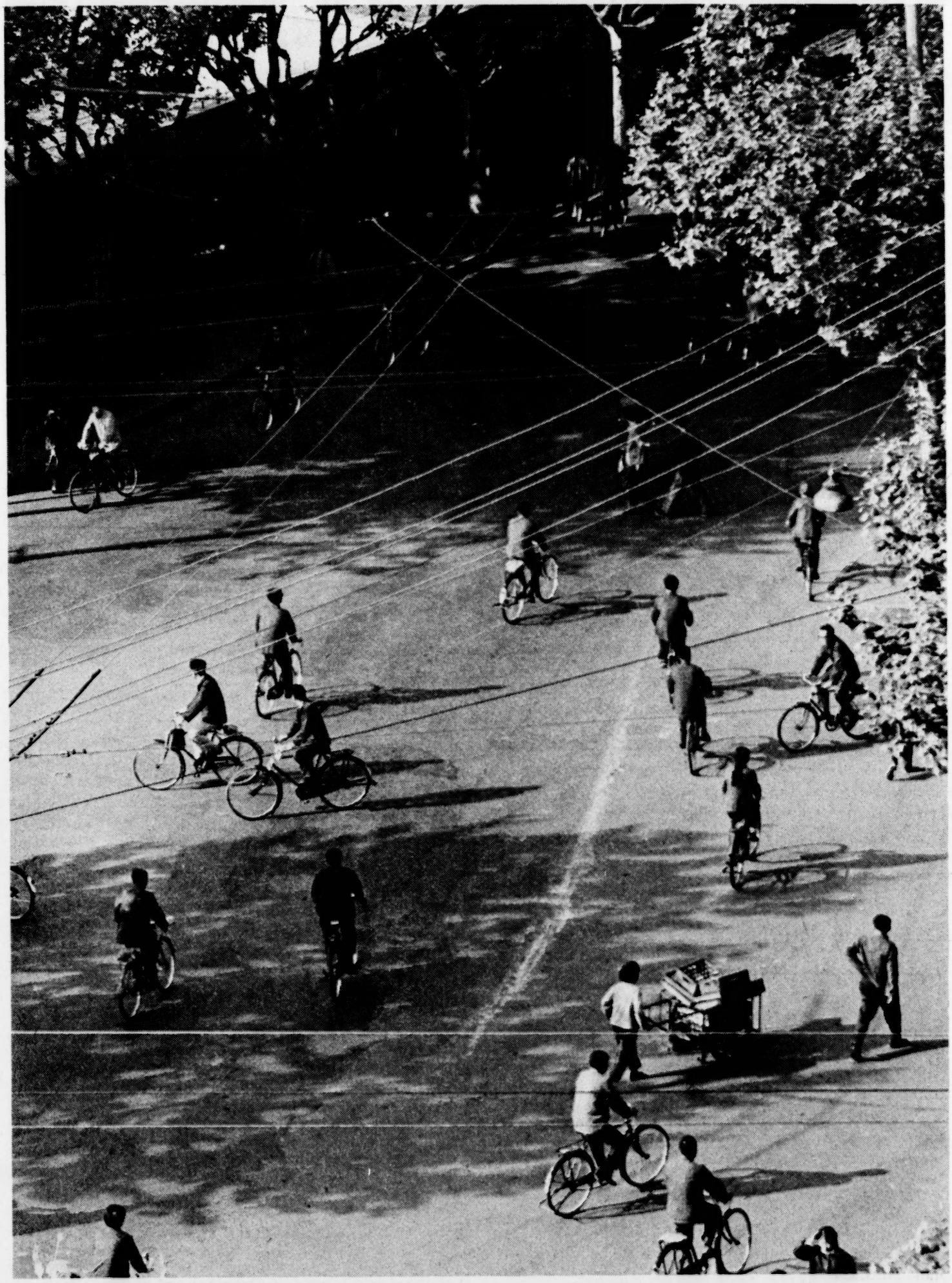
Conversation on Marriage Problems

"Well, yes of course, we sometimes feel a contradiction between our home life and our work and politics. If you're working all the time late, and so is your wife . . . well, I'm not saying that it is always easy. But if you're out late and don't come home, at least your wife doesn't worry. Why should she? What can happen? It's not like before when she might have thought you were out playing around with someone else. That doesn't happen. Well, I won't say never. But it's rare. So, people don't feel so suspicious."

It's dark in the moving bus. Lao Liu, an effervescent middle aged man rattles on about marriage, a subject most Chinese seem to avoid.

"Fights between husbands and wives? Well, there are still some. But not so many. People marry late. Men are thirty and women late twenties. They have more experience, and they are politically more advanced. If there is a disagreement . . . well, you know about criticism and self criticism. We try and talk about it; figure out the contradictions in the problem. If there's a big fight, OK. Everyone around will know, right? We all live so close. So, you can't keep it private. Sure, we might feel a little embarrassed. But, maybe it's better anyway. People hear and come to help. They might say, 'OK, now what's wrong? What are the problems here? Just sit down. Take it easy!' "

"It's mutual help. Very few people get divorced. You know, we have a whole different social system. There is not so much emphasis on romantic love and two people's private lives. It's not like your country, is it?"



Bicycles in Shanghai Street **There are no private cars in China.** ■

from FIELD GUIDE TO WESTERN OREGON

BY DAVID SHETZLINE

Fenderman's Bait Barge floats on the bay's neck, straining its anchors when tides sweep our channel. At full high or dead low it corners the compass, but between tides any boat suckling up must reverse engines, ease to neutral, forward, neutral, again reverse, finally cinch short ropes. Fish can then be passed over, crimped at tails, color of tightly rolled slippery ten and twenty dollar bills. Fenderman's son helped until a few years ago when he was shot dead shortly after being caught poaching deer by a State Police game warden. Somehow the boy's rifle went off, the Warden died, Fenderman's son panicked and after a howling chase there was a gunout at the police road block or possibly another darker and even less excusable accident. . . From the deck of his barge Fenderman can study the hill's amphitheatre, count his neighbor's houses, watch seagulls cock heads high above the cemetery where his son rests, see sheriffs and state policemen and wardens and town cops pass over the bridge spanning the narrows. Except for an occasional early boat, for a large part of the day, Fenderman can be alone with himself at almost the exact geographic center of his town.

The summer of his son's death was a good bite and for awhile Lou had no help during the late afternoon rush so I cut bait early to come in, unload and weigh and shovel ice. He turned grey that season, a pathetic cliché, but true—— and something in the color brought out a Levantine handsomeness, as if theretofore he'd been in disguise. "Changes, Tad," Lou said just before his wife came regularly to help and I went regularly back to the evening bite. "I'm feeling myself change each day. Like these things the kids are taking now. But no hallucination. I feel sort of I'm growing some invisible beard. And I can feel liquids in me and at night hear 'em. Then everything looks different. Cleaner. And little things. . . fish ducks birds. . . you know. . . they seem real important. Sometimes I think I'm going crazy. I get sort of a whiff, a glimpse of . . . as if time were contracting. And I say *OK. OK that's fine with me. Anything that's* necessary. . . . *Let's get on with it.*

David Shetzline, of Seal Rock, Oregon, wrote **Heckletooth 3**—— *a forest fire novel that has a cult following in the Northwest and no following at all in the East. We reviewed the book enthusiastically this summer and then contacted Shetzline to see if he'd done anything recently that we might publish.*

He replied, "As for Heckletooth, I'm delighted you are thinking of reviewing it. Always thought it was one of the first of the New Ecological Novels but no one seemed to pick up on it. Indeed the NY Times literarycunt didn't show a single spasm of good taste and clawed the book down with avengence. I mean it might have been some resurrected Populist Tract reissued by the same crazies that bring us AWAKE! for all that he. . . but fuck it. Rather dismal experience that review; after all these years the mere idea of that review and the vast primordial commercial vacuum it introduced and I shudder . . . Whatever, someone down south in Your World—— Shambhala or Serendipity or maybe one of your own undertakings brought up the remaindered copies, some two thousand odd. Random House had lived up to its name and dropped the thing as if it were some unspeakable confession of the mad ghost of Johnny Appleseed or whatever. So regional, so hopelessly countrified. . . . And yet a few years later they were publishing some really fine stuff. So it goes. . .

"Other than that I've been working on a novel. Now finished. . . the book is a 1975 rewrite of Great Gatsby (in a warped way) with a can-a-person-achieve-happiness-the-second-time-around-at-marriage for the oldies; what's-happened-to-the-revolution for the youngies; and a fairly definitive trip on commercial fishing for General Interest."

What follows is excerpted from the novel (called **Field Guide to Western Oregon** *and looking for a publisher.) The storyteller is Tad Slocum, an Oregon Coast fisherman cornered into some Life Decisions and checking with all his wisemen for guidance. Lou Fenderman is one.*

—SB

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A portion (Oregon coast) of Erwin Raisz' map, "Landforms of the Northwestern States" (1941, 1965). For copies of the 35" X 26" map, send $1 to Erwin Raisz, 130 Charles St., Boston MA 02114.

"I've felt that sometimes in a storm."

"It's like the sound of the ocean but in reverse. The ocean's always coming in but this sound's moving away."

We were smiling to each other when he motioned for me to bend and peer under his desk. Clipped upside-down was a Winchester pump, sawed short, heavily greased. For several moments I couldn't understand, then it rushed into my mind. You see, when the pair of State Police told him about his son, they stood there—— hats in hands on his bright white barge while gulls whirled, waves lapped—— and told Fenderman over that very desk. "Jesus Christ," I oggled his Winchester as if looking through some cosmic keyhole.

"Maybe. Maybe not. What's the difference? You see?"

"Lou, I could hear your defense. . . *They were a little surprised but still breathing fine when they all sort of fell off the side of the barge. Then all that buckshot they'd caught just sort of took them to the bottom."*

Fenderman shrugged. "I never even came close they were so worthless."

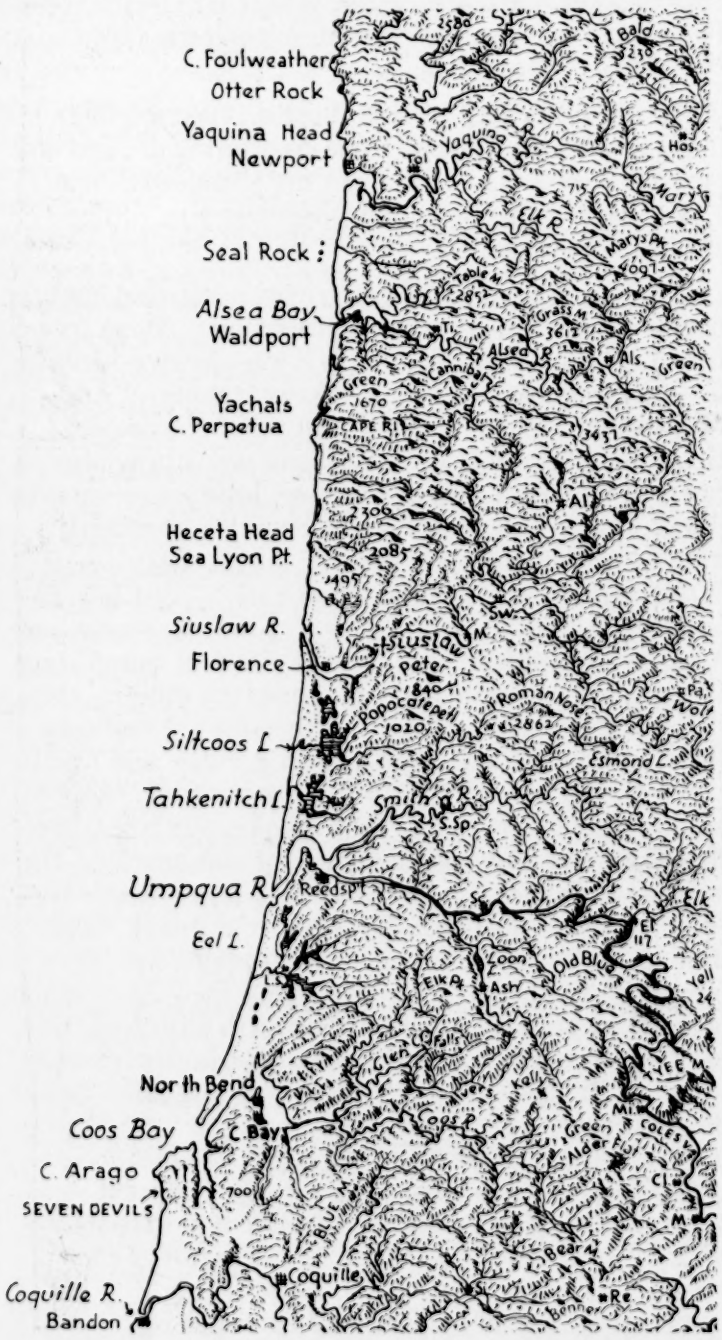
When the other half of the question lurched into focus he must have seen some tightening around my eyes because he lay a hand on my shoulder. "Tad, I'm going to tell you something I bet you'll think about a long time."

Lovingly, wonderingly Fenderman described his life back east; with many starts, adversions. Time to time he brushed his head with a long brown hand, as if to rid spiderwebs or some vague itching. "And I just stood still for it, that's what gets to me yet. Drove my cab six days a week and went bowling—— can you believe. . . Until I was—— let's see—— maybe thirty, thirty-one. Then I was having a beer with a friend of mine, an older guy—— maybe fifty, fifty-five. All of a sudden its sort of—— not like he was drunk—— but sort of he *snapped* into something. And he starts this long, almost hysterical monologue about us being Cabbies. The work, the danger, the—— the unsung heroism. Can you imagine? I just sat there feeling the floor had dropped away and I was about to fall off into this bottomless sewer. And I was smelling everything: The smoke, the beer, the streets, noise, noises everywhere. I was smelling the *noises*, you understand? And I thought: this is it, *this is always.* So that night I got real drunk, first time in my life so drunk I couldn't stand up. My friend drank himself sober watching me. Then when he couldnt even *believe* my condition anymore, he took me home where I was sick. For hours. I sat on the toilet and was sick out of one end, sick into the washbasin out of the other and if I could have been sick from under my fingernails I would have been sick there too. Then *mercifully*—— and I mean that, Tad. For the first time I understood what—— not the word—— but the *thing* of mercy meant. . . I passed out. When I could function I raised up off the bed, woke my wife and told her

to look out the window. It was daylight and I had this godawful headache but I kept talking around, thinking around where it hurt like hell. I said *Hon. Take a look out at the streets.* And she was so scared, she just did. I said: *If you want we will never have to look at this again.* Then something happened to her face. . ."

Fenderman lowered his voice. "As if I was God. But at the same time, she was God. She said: *Lou we're goint to have to work.* And I said, that's right, but first we're going to have to steal. *All right then Lou, let's steal. . .*

And so—— as he told me—— if he had answered her *All right then, we'll work*, they would have made up lists, schedules of self-improvements, new budgeting; and gradually their energies would have dissolved until no realistic way remained they could physically, tangibly change. But he had seized their condition: it demanded he cut them loose. So a few days later Lou took himself to the local loan shark where he conned five thousand dollars due back in thirty days at one hundred percent interest.



"He was no fool, Tad. He suspected. But he had too much pride. He existed off idiots like me who'd tied themselves to something as idiotic as driving other idiots from one idiotic place to another. Yet he *almost* knew, I could tell how he looked at me, looked through me, all over me, fighting what he wouldn't accept. . . They all have a sort of gesture. You know. A thing they do to allow you to realize you're crazy. Not crazy to have come for their money, that kind of crazy they eat on. But *realiy* crazy. So crazy you've stopped kidding yourself and don't intend for a moment to pay back. I kept waiting for his gesture, cause I knew when it came I had him. Finally he grunts and says, *Hey, you like old things?* He reaches into his bottom drawer, takes out this long-necked telephone, dial on the base, speaking horn in a cradle, frayed brown wire. *It's old fashioned, this phone. But works. Phones' old as this have always worked, even before there were such things as phones. Right?* I nodded. Just the right amount of nod. And he said: *Now I got other phones, and sometimes they're ringing all the time. But this old phone here I only call out. Funny an old phone like this you wouldnt think but I could call South America. You think I ever called South America?* I said No.

Why?

Because I dont think you ever had to call South America.

But it would work. That's the beauty of old things. I have faith in them because the very few times I have had to use old things they always worked.

Thinking about Lou's confession, especially since last summer, I realize Lou, in facing his condition, affirming his decision, then moving himself the width of a continent, adopting a new name, moreso, adopting a life that *is not* idiotic—— he often gestures along the waterfront at the canneries huddling close to each other, explaining: *I help keep them honest*—— in all this Lou is an inspired man. A political man. In the largest sense what else is there? We must *all* be saved. *All of us.*

But why the money? I asked him. And he answered: *I'm not sure, Tad. I'm not sure where money belongs. It certainly didnt belong with the man I stole it from. And it didnt belong back east——too much mischief that money made back east. Maybe it didnt belong with me, but in a way it sure as hell belongs out here.* . . . I did not press him further because——whatever ——he's paid up.

In a way it's people like Lou I imagine peering over my shoulder, reading what I write—— lips moving slightly, of course—— but small celebrations in this particular brushpile. His sawn down Winchester? Perhaps he couldn't teach himself to feel anything but naked without it clamped at the ready, magazine packed with double-ought buckshot, worse, magnum goose loads or mangle-ums. Maybe he kept it out of love for the town; because whatever emissary of that corruption might someday face him over his desk he would have to be dispatched like a rabid dog. ■

SOUTH OF THE SLOT

WITH CUB CALLOWAY, ACE REPORTER

BY DAN O'NEILL

TONIGHT'S EPISODE
JAWS
MY EDITOR SAYS TO GO TO PETALUMA.. A HOT STORY!! I DRIVE UP.. EXPECTING NOTHING..
DRINKY POO..
YEAH.. PETALUMA IS PETALUMA - SO WHAT'S IN PETALUMA..?
THAT'S WHAT I SAY.. SO WHAT'S IN PETALUMA..? JAWS, AL.. JAWS!!
I LOVE MY DRINKY POO
SHUTUP, HARRY.. WE KNOW YOU LOVE YOUR DRINKY POO..
IT SEEMS THAT SOMEONE HAS BEEN SNEAKING INTO THEIR COW BARNS AND BITING THEIR COWS!!
BITING THEIR COWS?
HUGE CHUNKS MISSING!! SO THE CITIZENS SET A TRAP..
..WANNA DRINKY POO?
..AND CAUGHT PROTEIN MAN!!
IT WAS REAL STRANGE, AL..
"I INTERVIEWED HIM AT THE JAIL.."
NO JAIL CAN HOLD PROTEIN MAN
IT SEEMS HE WAS A FORMER ADVERTISING EXECUTIVE .. ON THE GRANOLA HEALTH FOOD ACCOUNT..
..WHEN I SEE EVIL, I BITE A COW.. THE RAW FRESH LIVING MEAT TURNS ME INTO..
PROTEIN MAN..?
HE HAD LOVED THE GRANOLA ACCOUNT! HE HAD FELT IT TO BE AN HONEST PRODUCT.. IT GAVE DIGNITY TO THE AGENCY..
PROTEIN MAN! CHAMPION OF TRUTH!!
CHECK! PROTEIN MAN!" CHAMPION OF TRUTH! CHECK!
UH.. HOW LONG HAVE YOU BEEN PROTEIN MAN..?
HIS CAMPAIGN TOUCHED A PRIMAL CHORD IN CHILDREN! THE GRANOLA ROCKETED TO THE TOP OF THE SALES CHARTS!
CRUNCHY WUNCHIES WILL MAKE YOUR BONES REAL STRONG, KIDDIES!! ..AND NO ONE WILL BE ABLE TO BREAK THEM!!
CRUNCHY WUNCHY GRANOLA BREAKFAST TREAT
GRANOLA WAS PREFERRED BY YOUNG MOTHERS AS A LAXATIVE! THE MILK OF MAGNESIA ACCOUNT WAS INSANELY JEALOUS! WITHOUT CONSTIPATED CHILDREN THEY WERE FINISHED!!
ALL MY KIDS DO IT THE NATURAL WAY!!
GRRR HATE
AND THEN .. DISASTER! THE ANGEL OF DEATH, RALPH NADER, KISSED HIS PRODUCT GOODBY!
GRANOLA ISN'T ANY DIFFERENT OR HEALTHIER THAN CORN FLAKES.. IT IS MERELY CHIK.. SO IT COSTS MORE!
HE HAD STEPPED OVER THE LINE! HE HAD BELIEVED IN HIS PRODUCT! NOW IT WAS GONE.. AND SOON .. HIS MIND BEGAN TO GO TOO..
THE MILK OF MAGNESIA ACCOUNT WILL BREAK MY BONES!
HIS HAIR BEGAN TO FALL OUT.. HIS AGE (OVER 30) WAS SHOWING! HIS CAREER WAS OVER .. UNLESS..
I NEED PROTEIN!
HE CAME TO THE OFFICE WEARING A T-BONE STEAK ON HIS HEAD.. STUCK HIS HEAD INTO THE SUGAR ACCOUNT AND SAID..
BROWN SUGAR IS JUST WHITE SUGAR WITH MOLASSES!! HA HA HA HAHA HA!
HEALTH FOOD IS CHEAP FOOD WITH SOY SAUCE!
THEY FIRED HIM..
IT WAS A SHORT STEP FROM HIS RAW T-BONES TO THE LIVING FLESH .. IN SIX WEEKS HE MAIMED OVER 200 HEAD OF CATTLE!!
DO YOU THINK HE'LL BE LET OFF..?
TEMPORY INSANITY?
I AM WILLING TO TIPPLE A LIL DRINKY POO WITH YOU..
AL.. DOING SOMETHING STUPID ONCE IS JUST PLAIN STUPID..
DOING SOMETHING STUPID TWICE IS A PHILOSOPHY..
THOSE 200 COWBITES WILL KEEP HIM LOCKED UP A LONG TIME..
AS I AM TEMPORARILY WITHOUT FUNDS.. IF YOU WILL BE SO KIND..
SHUT UP, HARRY
O'NEILL

Gay Access

BY RICHARD HALL AND DAN ALLEN

There is a moment when injustices, borne mutely over the centuries, become intolerable and erupt into a new consciousness. In 1969, some gay men and women discovered that moment and started down the long road to political visibility and personal self-respect.

The changes have been coming ever since. Many professions now have gay groups (Association of Gay Psychologists, Gay Nurses Alliance, Gay Teachers Caucus, etc.). Dozens of colleges offer courses in Gay Studies. Gay student groups are plentiful (for a directory of these, write National Student Center, 2115 S St. NW, Washington DC 20008, 25 cents). Gay liberation bookstores exist in several cities. Good gay writing abounds — for a current Gay Bibliography (non-fiction) write Task Force on Gay Liberation, American Library Association, Box 2383, Philadelphia, PA 19103. For a mini-anthology of Gay movement materials, send $2.50 to Gay Info Data Bank, Gay Peoples Union, P.O. Box 90530, Milwaukee, WI 53202.

Below are listed some publications that document and explain the movement. We think they're for everyone, gay or straight, who wants to know more about his/her own spot along the rainbow continuum of sex. They are available by mail from:

Oscar Wilde Memorial Bookstore, 15 Christopher St., New York, NY 10014
Lambda Rising, 1724 29th St. NW, Washington DC 20007
Androgyny Bookstore, 1217 Crescent St., Montreal, Quebec, Canada
Paperback Traffic, 558 Castro St., San Francisco, CA 94114
Giovanni's Room, 232 South St., Philadelphia, PA 19147
Other Voices, 30 Bromfield St., Boston, MA 02108
Glad Day Bookstore, 139 Seaton St., Toronto, Canada

In case there's any lingering question about the sexual politics of The CQ, it may be briefly summarized. We enthusiastically approve of heterosexuality, homosexuality (both flavors), bisexuality, swinging, prostitution, masturbation, pornography, bestiality with consenting animals (which was left illegal in the new liberalized California sex law; it is rumored the SPCA will complain of this injustice) and, of course, women's lib.

Anything we're against? Yeah. Rape.

—SB

The Universities and the Gay Experience: Proceedings of the 1973 Conference sponsored by the Gay Academic Union. $2, GAU, Box 1479, Hunter College, New York, NY 10021.

At Thanksgiving 1973, and 1974, hundreds of gay academics, women and men, came together to share ideas, feel good and groove on gay pride. Here's the record of that coming together in 1973 in New York City (1974 transcript now in the works). Four papers were presented on Scholarship and the Gay Experience. Later, six teachers told about the terrors and joys of coming out openly in their universities.

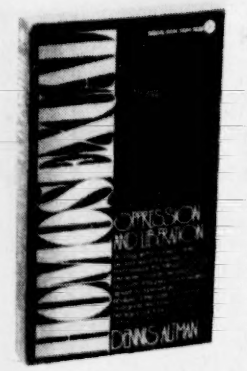
> And there I was in the classroom, teaching the glories of heterosexuality, of male domination, the triviality of women, the nastiness of gay people. And I couldn't go on doing that to myself, to my students, my gay colleagues. I'm a lesbian; and my continued silence perpetuated our oppression and helped to destroy those gay students who came to believe, through me, that that must be the only way to live. As gay academics, surely we understand that there is only one way to live, and that's with pride, and it's a heritage of pride we must pass on to other gay people.

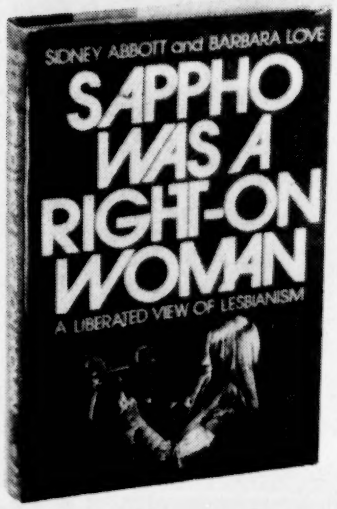
Journal of Homosexuality, $12 yearly, Haworth Press, 130 West 72nd St., New York, NY 10023.

A handsome new quarterly of empirical and clinical research. Among eight articles in recent issue, one gives personality profile of gay-haters, one offers poll of public attitudes towards homosex, two are studies of trans-sexual identity. Also included are book reviews and abstracts of articles on gender identity published elsewhere. The editors state that homosexuality is viewed as a valid lifestyle, not a pathology — an editorial bias they are proud of.

Special Issue, **College English**: "The Homosexual Imagination." November, 1974. Single copy, $2. National Council of Teachers of English, 1111 Kenyon Road, Urbana, IL 61801.

Gay themes have sounded in the world's literature from Sappho to Thomas Mann but your average lecturer has to skirt the subject, handle it delicately as a problem, or trivialize it. That's ending now, and this publication, celebrating homosexual writing from a pro-gay viewpoint, marks the new frontier. Particularly good is an interview with Eric Bentley, who gave one of the first Gay Studies courses (at Queens College, CUNY, 1972).





Homosexual Oppression and Liberation by Dennis Altman, Avon Books, $1.65.

Altman, a young Australian, is the finest analyst and theoretician that the movement has spawned. His writing is subtle, thorough and jubilant. Don't miss this one.

> We are, I believe, moving towards a far greater acceptance of human sexuality and with that toward both a decrease in the stigma attached to unorthodox sex and a corresponding increase in overt bisexuality. To see the total withering away of the distinction between homo- and heterosexual is to be utopian. I suspect, however, it will come before the withering away of the state and may indeed be a necessary prelude to that.
>
> Western societies rely on very considerable hypocrisy about sexual behavior, preferring epidemics of venereal disease and crippling back-yard abortions to any honest acceptance of the realities of sexual life. Nowhere is this more obvious than in the case of homosexuality, and both gays and straights have been caught up in a gigantic game of pretending that it in fact does not exist.
>
> Gay liberation will have achieved its full potential when it is no longer needed, for we see each other neither as men and women, gay and straight, but purely as people with varied possibilities. It is the fate of the Negro, James Baldwin once wrote, to carry the burden of both white and black Americans. It may be the fate of homosexuals to liberate both gays and straights.

The Gay Liberation Book. Edited by Len Richmond and Gary Noguera. $3.95, Ramparts Press.

One of those collections of first-person stories that seem fragmented until you've finished, when all the pieces drop into place. How terrible and rich are the experiences of these gay men . . . whether talking about their oppression, masturbation fantasies, male chauvinism, gay souls or their belief that society makes the homo-hetero distinction out of fears and guilts that will one day end. A book of anger and joy, a book to change the world.

> The one thing which males in this society fear the most, and are the most alienated from, is effeminacy. Effeminacy is synonymous with the loss of power, synonymous with what it means to be gay. As long as men insist upon retaining that power, they are the enemy of women and powerless men known as "queers." I contend that any male who feels it essential to his self-identity to say that he is not gay is my enemy.

Sappho Was a Right-On Woman, by Sidney Abbott and Barbara Love, Stein and Day, $1.95.

Starting with a description of the double-bind, no-win situation in which lesbians once found themselves, the book moves on to a history of the feminist movement as it came to terms with lesbianism. It also proves, in a life-giving way, that lesbianism, in forcing women to admit that their sexual needs exist independently from those of men, can be a vital force for the liberation of all women.

> One Lesbian watched her lover die in her arms and she did not say "I love you" because there were straight people present who would not understand.
>
> •
>
> Feminists demanded control over their own bodies and over the decisions that shape their lives. They demanded freedom from sex-role stereotypes. With independence foremost in their minds, feminists arrived at a turning point in the history of women only to find that Lesbians were already there.

Times Change Press seeks to expand the space available for personal liberation of all kinds – youth, black, feminist, gay. To achieve this, they offer books on communal living, psychohistories, poetry of love and change, ecology and song. The books are small, beautiful, inexpensive and made with a love that big commercial presses cannot match. Here are three we especially like, but we urge you to write for their free Catalog and choose your own. Write Times Change Press, 62 West 14th St., New York, NY 10011.

The Early Homosexual Rights Movement (1864 - 1935) by John Lauritsen and David Thorstad, $2.25, Times Change Press.

The struggle for gay rights has a history dating back 100 years, a history full of heroes and great events. Like the history of the women's movement, it is now being rediscovered, thanks to a few gay scholars who have refused to acquiesce in the eradication of our past. *[more →]*

Great Gay in the Morning! One Group's Approach to Communal Living and Sexual Politics, $2.25, Times Change Press.

Two lesbians and seven gay men who have lived together for three years tell who they are, why they came together, how they handled the work and money problems, what conflicts arose by sharing their commune with straight men and women, and what they learned about themselves. Full of insights on gay reality and human need. As one member points out, a revolution which doesn't enter the bedroom and kitchen cannot be taken seriously.

Amazon Expedition: A Lesbian/Feminist Anthology, $2.25, Times Change Press.

Articles on many subjects – historical, feminist, personal, political. The writers are passionate on the subject of lives wasted while catering to the spiritual and sexual needs of men, in exchange for nothing much.

Out of the Closets, Edited by Karla Jay and Allen Young, 1973, 403 pp., $1.95, from Pyramid Communications, Inc., 919 Third Ave., NYC, NY 10022.

This collection of about 50 articles and a couple of poems is a veritable Bible of gay liberation. Genesis is "Christopher Street Liberation Day, June 28, 1970." Revelation is "What We Want, What We Believe," a statement of Third World Gay Revolution.

Though there are no Matthew, Mark, Luke and John, there are brilliant articles by such people as Martha Shelley, Rita Mae Brown, Mike Silverstein and Gary Alinder. For instance Rita Mae Brown can speak with the power of scripture:

> The male party line concerning lesbians is that women become lesbians out of reaction to men. This is a pathetic illustration of the male ego's inflated proportions. I became a lesbian because of women, because women are beautiful, strong and compassionate. Secondarily, I became a lesbian because the culture that I live in is violently anti-woman.

Gary Alinder reports about his gay soul in a voice any bible might proudly display,

> I was gay long before I admitted my homosexuality to myself, long before I ever had sex, long before I knew what sex was.

Lavender U. Catalog, $1.00, from 121 Leavenworth, San Francisco, CA 94102.

Lavender U's purpose as stated in the catalog is "to provide Gay Women and Gay Men (and others exploring their gay feelings) the opportunity to share their knowledge, skills and experiences in a supportive educational and social environment."

Courses vary from a Gay Drama and Theater Workshop to Jogging for Fun and Exercise. There are often such classes as French, Music and A Gay VD Workshop along with most any artsy-craftsy, how-to course available in any free university. The catalog is a joy to read and will elevate and stretch any stretchable consciousnesses, gay or straight.

Edward the Dyke and Other Poems, Judy Grahn, 1971, $1.25, from The Women's Press Collective, 5251 Broadway, Oakland, CA 94618.

The satirical title work presents a scene of the psychoanalysis of a lesbian by a money-driven behaviorist.

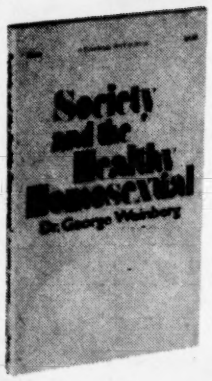
> "Now, my dear," Dr. Knox said, "Your disease has gotten completely out of control. After you've taken a thousand pleasurable penises or vaginas into your mouth, what have you accomplished? What have you got to show for it? Do you have a bridge club to show for it? No! You have only a thousand pleasurable experiences to show for it."

The poems have an intensity that is a characteristic of everything Judy Grahn writes.

> I have come to claim
> Marilyn Monroe's body
> for the sake of my own.

There is a lyric splendor too.

> I said 'you smell like the
> ocean' and lay down my tongue
> beside the dark tooth edge
> of sleeping
> 'swim' she told me and I
> did, I did.



Society and the Healthy Homosexual, George Weinberg, 1973, 148 pp., $1.95, from Anchor Books, Anchor Press/ Doubleday, Garden City, New York.

Weinberg, a practicing psychotherapist, has produced a small sociology textbook which reveals homophobia for what it is. The bias of psychoanalysis is dealt with (a bias that the American Psychiatric Association doubtless didn't eradicate with the vote that gay is not necessarily sick.)

About a year before the APA decision, Weinberg wrote, "The majority of therapists of nearly all schools, and not just psychoanalysts, view homosexuality as an illness. To most it is a special kind of illness, one too distressing to be looked at in close detail."

Weinberg gives his case against a gay person trying to convert to heterosexuality and takes a long look at what is good and healthy about gayness. He also deals thoroughly with how gay people might communicate with their parents: 14 useful suggestions on how to come out with parents and 6 valuable tips to parents of gays.

Lesbian Nation, Jill Johnston, 1973, 283 pp., $2.95, from Touchstone Books, Simon and Schuster.

After publishing **Marmalade Me** and before setting off on **Gullibles Travels** where she thanks god for making her in god's image, Jill Johnston came upon herself in the wilderness we call the world.

Much of **Lesbian Nation** is from her articles in "The Village Voice." Though her style (writing- and life-) are not for every palate, neither were Gertrude Stein's or Walt Whitman's. She makes sense.

> I never said I was a dyke even to a dyke because there wasn't a dyke in the land who thought she should be a dyke or even that she was a dyke so how could we talk about it.

She can move mountains.

> Now there is only one way for social change to take place. And that is for all gay people, those who know it and accept it, to stand up and speak for themselves. There is no other way.

America, I'm putting my queer shoulder to the wheel.

– Allen Ginsberg

GAY CHURCH GROUPS

All organized religious groups have treated gays as pariahs, and there are gay religious groups all over the country. One is led to look on with wonder. (If they practiced sodomy in Sodom, what on earth did they do in Gomorrah? Is religion to become the opiate of the gays?) Here are San Francisco addresses of some groups, nearly all of which have meetings in other cities.

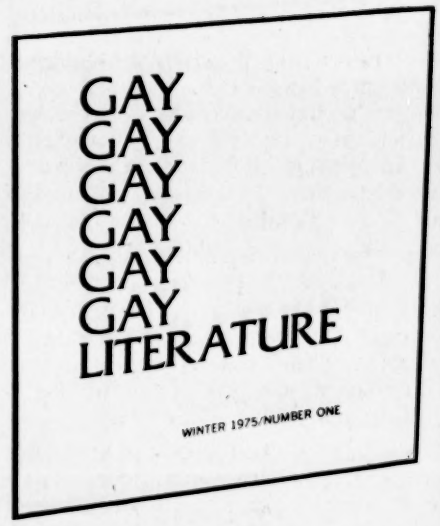
Achvah, Jewish Gay Union, P.O. Box 5528, San Francisco, 94116.
Council on Religion and the Homosexual, 83 McAllister St., San Francisco 94102.
Dignity, Gay Catholics, P.O. Box 16246, San Francisco 94116.
Emmaus Foundation (Named for the town where a risen Christ, seeming somewhat wired, apparently appeared to two gay men), 934 Page Street, San Francisco 94117.
Gay Methodists Caucus, c/o SIR, 83 Sixth Street, San Francisco 94103.
Metropolitan Community Church, the mother church for this largest, most widespread and earliest organization of gay Protestants is at 1050 South Hill, Los Angeles. The San Francisco group operates at 1076 Guerrero.
Unitarian, Universalist Gay Caucus, 1187 Franklin St., San Francisco 94109.

Nearly all of the gay churches have newsletters, which can usually be obtained for a dollar. One of the most educational and delightful newsletters come from – hold onto your seats – Fort Valley, Georgia . . . **Integrity: Gay Episcopal Forum**, 701 Orange Street, No. 6, Fort Valley, Georgia 31030 takes much of its witty and hardhitting style from a gay couple Ernest Clay and Louie Crew.

These gay spouses, one a black cosmetologist who used to be a practical nurse and the other a white professor in a black college, are integrating rural Georgia, proud and unafraid. An example of an item in their March 1975 newsletter puts the new testament in some perspective

> Jesus said, Go, get your husband and come back.
>
> She stood still. I have no husband she said.
>
> Jesus winked, Honey, of course you have no one husband: you have had five, but the man you live with now is not even one of those.
>
> She said, Sharp! But if you're so smart, where's the right place to worship, deary, here on this mountain as my tribe says or down in the bars with your tribe?
>
> Jesus said, The place doesn't matter anymore.

[more ➔]



Child of Myself and **Pit Stop**, two bright collections, Pat Parker, 1972, and 1974, $1.00 and $1.50 from: The Women's Press Collective, 5251 Broadway, Oakland, CA 94618.

These collections of poems, surging from the consciousness of a black lesbian, will hit you hard. Pat Parker is a realist:

> In English Lit.,
> they told me
> Kafka was good
> because he created
> the best nightmares ever —
> I think I should
> go find that professor
> & ask why
> we didn't study
> the S.F. Police Dept.

She looks at herself honestly and can lead readers to look at themselves with new vision:

> I do not claim all possible
> Creating myths of modern America.
> I cannot swim an ocean.
> I attempt the width of a pool.

Homosexuality and Psychological Functioning, Mark Freedman, 1971; 124 pp., $3.95, Wadsworth Publishing Co., Belmont, CA 94002.

Acknowledging that homosexuality is so diverse and complex that only selected aspects of it can be discussed meaningfully, Freedman thoroughly explores well over 100 psychological studies of gay people.

His book is filled with rich and varied case histories. He states that, with regard to sexuality, people should be allowed to engage in any behavior that does not directly harm others.

This is one of the first psychology textbooks to deal with the complexity of gay people and psychological functioning in a wholesome, intelligent manner. (Indeed it is one of the very few not written by a trembling and wrathful Porky Pig.) The book includes a remarkable study of the Daughters of Bilitis as well as acute observations about what normality might or might not mean.

Rubyfruit Jungle, Rita Mae Brown, 1973, 217 pp. $4.00, from Daughters, Inc., Plainfield, Vermont.

Rita Mae Brown deals with real life, salty and a bit like the memory of the way a penny tastes, life like something Carson McCullers would probably have done if she had been a young woman in the 1970s. It is about families.

> Mothers and aunts tell us about infancy and early childhood, hoping we won't forget the past when they had total control over our lives and secretly praying that because of it, we'll include them in our future.

It is about friends.

> "Got yourself a new girlfriend, Calvin?"
>
> "Not me, I don't go in for girlfriends." He winked at the waitress.
>
> I looked at him with grateful eyes, "You gay?"
>
> "Oh, I wouldn't say I was gay. I'd just say I was enchanted."
>
> "Me too."
>
> He breathed a sigh of relief and smiled. "Right on."

And it is about lovers.

> Her eyes widened and she started to balk, but I wasn't in a sympathetic mood. I held her tight and delivered a long French kiss. She loved it. She loved it and hated me for making her love it.

Gay Literature, $2.00 single issue, $8.00 a year, Edited by Daniel Curzon, English Dept., State University of Calif., Fresno, CA 93740.

Here is a literary quarterly with some of the most provocative of recent gay fiction, reviews and poetry. Mr. Curzon has said that he is proud to have this magazine coming out of the Sodom of California's Central Valley; Bakersfield, he hurriedly points out, is Gomorrah.

In a recent issue Curzon himself has a story about the narrator's murder of a young woman writer, suspiciously like the one who wrote a blurb for the author's **Something You Do in the Dark**. The story is guaranteed to freeze the blood of Pat Parker's English Lit. professor and would probably make even Dostoyevsky turn over in his gay grave. ■

New diaphragm — no jelly

A woman gynecologist from Holland introduced me to the spring diaphragm (I had already gotten pregnant using a regular 'phragm and jelly). The difference, as she demonstrated on a plastic model, was that a regular 'phragm can be pushed out of shape by the force of the penis; the spring model cannot. It is hinged and folds in half for insertion, but it won't collapse during intercourse.

Then she explained the shortcomings of spermicidal jelly. It is effective for less than an hour, she said, and sperm live many hours. She believes a hit or a miss depends on the diaphragm and not on the jelly, that the emphasis on mandatory jelly is a drug company hype. I never liked jelly anyway, because if it could kill sperm, what other kinds of cells does it kill?

So it's a simple battle of the 'phragms, and I think the spring variety wins hands down. It's even easier to insert. I have used it successfully without jelly for more than two years. Maybe I'm lucky. This doctor has other patients who use it jellyless, but she does not say for sure that it's safe. She advocates using jelly if you need a lubricant, or if it makes you feel safer.

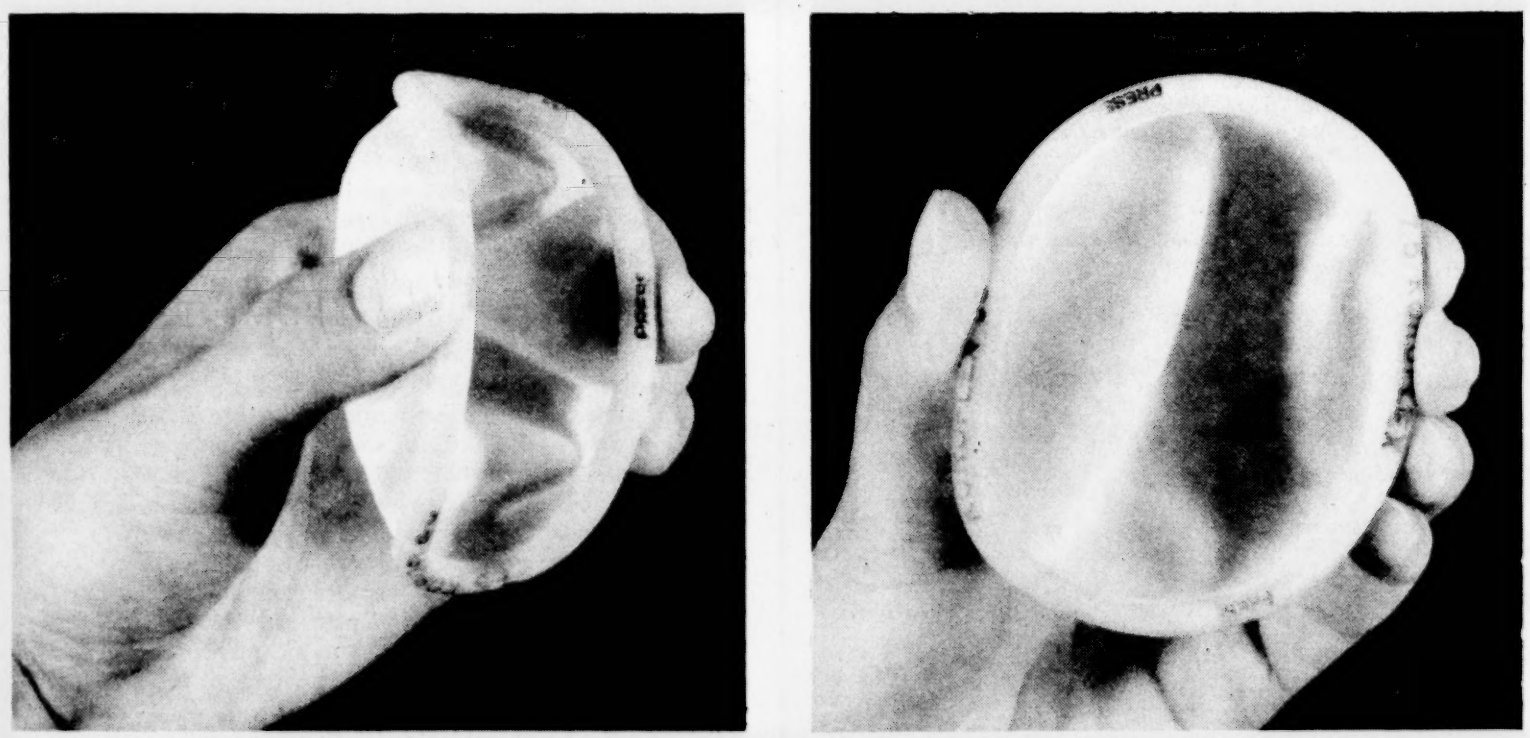
Like the collapsable 'phragm, the spring variety comes in sizes and must be fitted to your vagina. Because it is less flexible, a good fit is especially important.

Even if you use the pill or an IUD, it is a good idea to put in a 'phragm before intercourse during your period. Less messy, yes; but mainly it serves as a germ barrier. The mucous plug that keeps germs out of the uterus is sloughed with the beginning of menstruation, and does not re-form for a few days. The diaphragm therefore, fills in as an artificial mucous plug.

The way to get a Koro-Flex "Contouring" Diaphragm is through your doctor, who can order them from the Holland-Rantos Company.

—Rosemary Menninger

Koro-Flex "Contouring" Diaphragm
Holland-Rantos Co.
Piscataway, NJ 08854



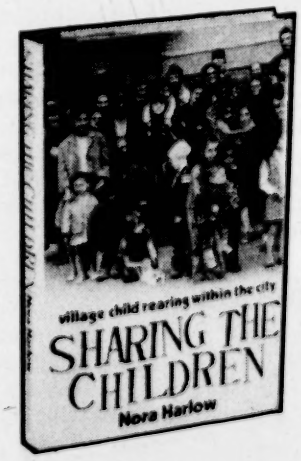
Push opposite the hinge — it folds for insertion. Push anywhere else — it holds its shape.

Sharing the Children

The problem: to distribute the duties of child-rearing more equitably, to alleviate the tensions in family life resulting from the needs of children and to do a better job of raising the children. Solution: co-operative child care, re-creation of the village within the city, a group of parents sharing their children by organizing an unorthodox day care center that is non-institutional, uncertified, time-funded, self-equipped, and determined only by the participating persons (miniature and large economy size). This is not an instructional book that outlines how to start a day care center — except as an account of a particular and successful one which was formed almost eight years ago in the Morningside Heights area of NYC and is still going. The story is well-written and uplifting. I was entranced and I don't even have children.

—Diana Fairbanks [Suggested by Lester Natzger]

Sharing the Children
(Village child rearing within the city)
Nora Harlow
1975; 154pp.
$7.95 postpaid
from:
Harper & Row General Books
Keystone Industrial Park
Scranton, PA 18512
or Whole Earth



It wasn't being mothers that we hated so much. It was that being a mother at this particular time and particular place meant isolation, meant only being able to use your mind in a very limited way, meant spending years of your life in the company of child minds and child emotions. The structure of the relationship with the child was wrong. Banding together as women with young children, we quickly found that our fears of separation were groundless. We hadn't separated at all. We had just included more people in the circle of mother and child.

Ecotopia

It doesn't really matter when things don't happen on time in Ecotopia. People grease and paint their bodies and cheer over spilled blood in the ritual war games. "The family" means some dozen or twenty folks coming and going and sharing the chores but no woman has a child unless she chooses the man. And it's not that things are sexually promiscuous at all . . . they're easy. (Organized promiscuity is limited to a few days on either side of the solstices and equinoxes, meaningful times of the year.) William Weston doesn't think of himself as the square reporter from New York, United States, the first foreigner to enter Ecotopia since the great war of succession in 1980, but as we develop a feel for Ecotopia, we the readers and Weston our narrator all begin to pick up vibes of our own squareness. What was once northern California, Oregon and Washington has become (by the year 2000) bucolic, calming, rhythmical and sensible. Climaxes (both sexual and violent) are there but they occur at reasonable, natural intervals. It is a question of values.

Ecotopia *is an extrapolation. In retrospect the tendency towards its formation could be detected as early as the mid 1970's. The first step was rather inconspicuous: the publication of a small scientific journal, accessible and with style, called the* **CoEvolutionary Quarterly**. *[Reviewer's imagination taking over here. –SB] No one thought the banning of* **The CQ** *by the National Academy of Sciences, The National Science Foundation and the American Association for the Advancement of Science would ultimately lead to civil war and the successful secession of Ecotopia.*

–Lynn Margulis

Ecotopia: The Notebooks and Reports of William Weston
Ernest Callenbach
1975; 167pp.
$2.75 postpaid
from:
Banyan Tree Books
1517 Francisco
Berkeley, CA 94703
or Whole Earth

San Francisco, May 12. It is widely believed among Americans that the Ecotopians have become a shiftless and lazy people. This was the natural conclusion drawn after Independence, when the Ecotopians adopted a 20-hour work week.

•

Healdsburg, May 17. Wood is a major factor in the topsy-turvy Ecotopian economy, as the source not only of lumber and paper but also of some of the remarkable plastics that Ecotopian scientists have developed. Ecotopians in the city and country alike take a deep and lasting interest in wood. They love to smell it, feel it, carve it, polish it. Inquiries about why they persist in using such an outdated material (which of course has been entirely obsoleted by aluminum and plastics in the United States) receive heated replies. To ensure a stable long-term supply of wood, the Ecotopians early reforested enormous areas that had been cut over by logging companies before Independence. They also planted trees on many hundreds of thousands of acres that had once been cleared for orchards or fields, but had gone wild or lay unused because of the exodus of people from the country into the cities.

•

(May 18) Marissa says I am squeamish about violence. Makes fun of American war technology, claims we had to develop it because we can no longer bear just to bayonet a man – have to spend $50,000 to avoid guilt, by zapping him from the stratosphere. This because last night I expressed dismay at the ritual war games. "Listen, you'll love it," she said gaily, "you're just ripe for it!"

TRUE Representation

BY MICHAEL PHILLIPS

If you were on trial for your life, would you want your jurors to be ELECTED?

On both the local and federal levels of government I have become distressed at our governmental structure. On the local level I did two high quality surveys (scientific sample-thorough interviewing) of San Franciscan's opinions and found that on important issues the citizens differed significantly from their so-called governmental "representatives." The citizens of San Francisco (since the first survey in 1973) have been in favor of legal prostitution, open access to pornography for adults and complete freedom for homosexual relations between adults. The ratio has been 3 to 1 for the majority and yet the city government and its enforcement agents proceed merrily in the opposite direction. This reminded me that on the federal level the same prevails in many areas: on gun control, those favoring strong gun control was 789 to 22 in 1964 and still appears to be at that level, however, nothing has been done.

Then it struck me that I have a concept of REPRESENTATIVE that is distinctly different than the one built into our government. My view is the statistical one that a "representative" sample reflects all of the properties of population in certain stable mathematical proportions, and the "best" sample is a random sample where each member of the population has an equal chance of being selected.

This absolutely does not correspond with the U.S. Congress which is almost entirely white males who are old, mainly lawyers, fairly well educated, and have the distinct personal characteristics of "politicians." Most "politicians" I know have personal ambition, general insensitivity to human relations, a lack of tenderness and many other negative qualities not common in the general population. Of course, statistical theory of "representativeness" is only thirty years old, while the concept of representation built into the government was codified in a Constitution two hundred years ago with the prevailing ideas of that time.

I would like to suggest that a scientifically random selection of legislators would be a significantly better system of government. In accordance with some previously determined eligibility criteria, citizens would be enumerated (people in prison or under indictment, in mental institutions, or under some age level might not be included). From this enumerated population there would be periodic selections of samples to be the legislators. This is of course the concept behind juries and grand juries, but not the practice. There would be no exclusions from the sample once it was drawn. If someone were selected and paid at the current rate of legislators but didn't wish to serve he or she would still be paid and therefore serving in a statistical concept. Of course, the legislation would be "representative" under this plan because it would include drunks, lawyers, geniuses, blacks, women, homosexuals and prostitutes in proportion to their occurance in the total population.

Robert Gnaizda has suggested that to make this politically acceptable part of the current Congressional structure be kept; the Senate would be elected as it is currently and the House would be selected randomly. Using the Senate this way would appear to maintain States' powers, but over time the power of the House would become apparent and its ability to generate new leaders so obvious that it would replace the Senate entirely. ■

Nomadics

The Honda station wagon

There comes a time for many of us when we have to buy a car, and an unreliable used one isn't the answer. What is? Most of the new cars have a true mess of smog-reducing equipment tacked onto engines never intended for such outrage. Some manufacturers have come out with new engines that also need such tacked-on "answers" to pollution; apparently they hope that the nasty environmentalists will go away. Cars built with this attitude are at least neater looking under the hood than many, but all such after-the-fact antipollution equipment has a terrible problem: it is not going to age well. In fact, after a few years, they are very likely to be serious maintenance problems and pollution as well. Regrettably, some very fine new designs such as the VW Rabbit fall into the above difficulty in the engine room, and also rely on the very suspicious catalytic muffler.

So what car do you buy? There's only one, and fortunately it's proving to be a good one. The Honda Civic CVCC. Better, it now comes as a really useful station wagon. (Small cars are at their best as wagons, as that body style greatly increases their ability to haul a variety of loads). The Civic has no smog equipment at all; no pump, exhaust gas recirculator, gulp valve, catalytic muffler or fancy controls. It just has an engine honestly designed to not pollute. The way it does this is called "stratified charge" which is a method of controlling burning temperatures in the engine at levels that don't generate pollutants. The only obvious change in the engine is that each cylinder has two intake valves.

Honda has put this engine into a front wheel drive chassis of very modern design. The result is extraordinary interior space for a small car, good crosswind stability, and a very "forgiving" personality in fast corners. Also has very good off-road traction and 7" ground clearance. You have to drive one to see how good a small car can be these days. They have a level of workmanship that is not often seen at less than Mercedes prices.

There are shortcomings too, of course. They rust in salt country, and the upholstery has not stood up very well. (Both can be prevented). For the few mechanical problems they've experienced, the word is that the factory has generally been very good about fixing things. Dealers are sparse but have a reputation for enthusiasm. Owners have a reputation for enthusiasm too. Reminds me of VW owners in 1956. So all is not lost. There is at least one company out there trying. I recommend a test drive, and that is something I don't do very often, much less with pleasure. Meanwhile, our 8 year old Citroen wagon soldiers on at 200,000 miles and no overhaul . . .

—J. Baldwin

Honda Civic CVCC

about **$3500.00**
out the door

Fixing Cars

Chapter One is entitled: "Women and Cars," and in a book with this one's title, don't expect to find many jokes about sisters running the Buick through the back end of Hubby's garage. This is serious revolutionary mechanics, though still a primer. There is a good rap on how Detroit has messed over the world, and why to go on ahead and try to keep the old lunkers running; there are nice simple illustrations, good tool advice, and nice political auto cartoons by quite a few folks, including Dan O'Neill. Taken as a primer, it is new and good. Taken as an automotive repair book, it still suffers from the attitude that there are jobs (wheel alignment, for instance) which are better left to the experts, whereas I believe that the people might benefit from the realization that the baling wire repairs of depression fame were not so much expressions of Okie idiosyncracy as they were the peoples' way of dealing with an industry based on the myth of technician and tool worship. The basics are here. Decide for yourself how far you can run with them.

— J. D. Smith

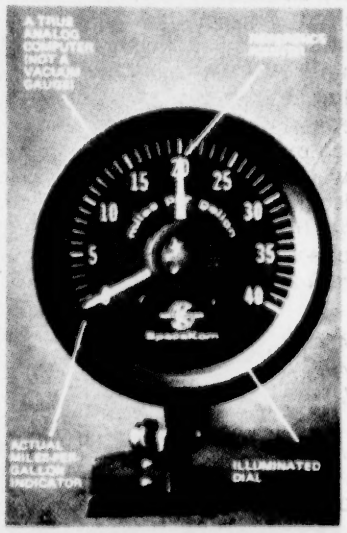
Fixing Cars:
A Peoples' Primer
San Francisco Institute of Automotive Ecology
1974; 191pp.
$5.50 postpaid
from:
Fixing Cars
52 Dore St.
San Francisco, CA 94103
or Whole Earth

Miles-per-gallon meters

One way to cut fuel use is to know accurately how and when you're using it. These gauges are calibrated in miles-per-gallon, gallons-per-hour, or total fuel used. They show the effects of short-cuts, tune-ups, speed changes or driving habits. You should be able to save their cost within a year or so. You'll probably be appalled at how you've been fooling yourself concerning how much money you spend on fuel.

—J. Baldwin

Miles-Per-Gallon Meter
$39.50
Gallons-Per-Hour Meter
$49.50 - up
Fuel Consumption
Totalling Meter
$49.50 - up
from:
Spacekom, Inc.
212 E. Gutierrez
Santa Barbara, CA 93101



Geological Highway Maps

No red lines across vacant political boundaries No frustration when a beautiful mountain, ridge, red mesa, folded granite butte or deep black plain rolls by the car window. These are incredible Highway maps with more densely packed information than most textbooks on American landforms. For instance, each map has five maps: (1) a physiographic map of the major landforms and watersheds; (2) a tectonic map showing major uplifts, downwarps and fault lines; (3) a beautifully colored geology map showing all the highway routes so you can check out the rock formation you are driving through; (4) a geological cross section to show the structure of the rock formations below the surface; and (5) a chart to color co-ordinate the rock you're driving past with its age and mode of formation. In addition, there are special maps like the extent of glaciers in Alaska or a history of the ancient seas of Utah.

Driving from San Francisco, to Denver, I used these maps and **Natural Regions of the United States and Canada** *(EPILOG, p. 475). Despite some overly techno-lingo in* **Natural Regions**, *the combo was an enlightening field guide to North American earth-works.*

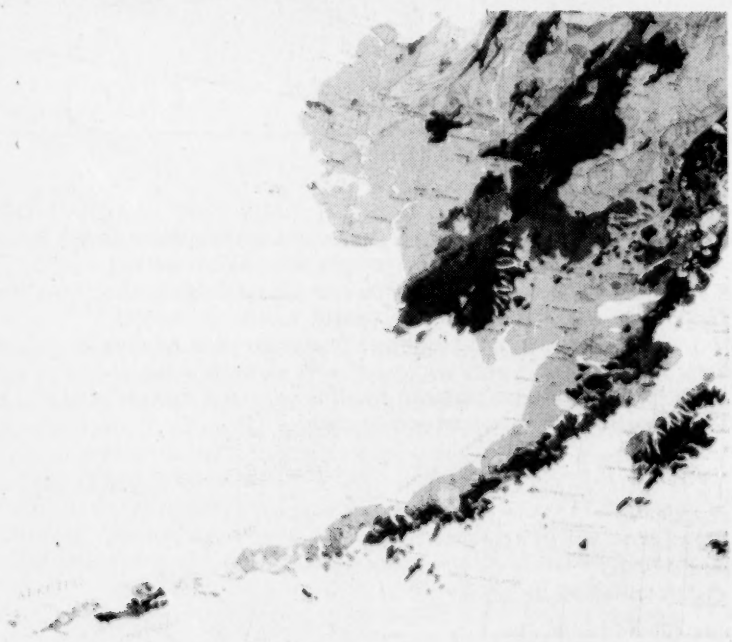
(A similar series of vegetation and life zones would be most welcome.)

—Peter Warshall

Geological Highway Maps
$2.50 postpaid (folded)
$3.00 postpaid (rolled)

from:
American Association of Petroleum Geologists
P.O. Box 979
Tulsa, OK 74101

Maps presently available:
Map 1: Mid-Continent (Kans., Mo., Okla., Ark.)
Map 2: Southern Rockies (Ariz., Colo., New Mex , Utah)
Map 3: Pacific Southwest (Calif., Nev.)
Map 4: Mid-Atlantic Region (Ky., W.Va., Va., Md., Del., Tenn., N. Car., S. Car.)
Map 5: Northern Rockies (Ida., Mont., Wyo.)
Map 6: Pacific Northwest (Wash., Ore.)
Map 7: Texas
Map 8: Alaska and Hawaii



Gas Mileage Guide

From the Environmental Protection Agency comes a FREE mileage rating of all new cars.

—SB

Gas Mileage Guide for New Car Buyers
Free

from:
U.S. Environmental Protection Agency
Washington, DC 20460

Snow Camping & Nordic Skiing Gear

Agreeable and densely informative books made of articles from **Nordic World Magazine** *($4/yr, bimonthly from address below). Get out in the snow and stay out.*

—SB

Snow Camping
(A Lively, Illustrated Guide to Enjoying Winter Camping)
Nordic World Magazine
1974; 125pp.
$2.50 postpaid

Nordic Skiing Gear
(Skis, Poles, Boots & Bindings)
Nordic World Magazine
1974; 64pp.
$1.75 postpaid

Both from:
World Publications
P.O. Box 366
Mountain View, CA 94040
or Whole Earth

Having touched on the subject of freezing to death, Odd covered the essentials quickly and simply. "If I see a frozen person — I don't care if you are man or voman — I strip you naked and take you into my sleeping bag!"

Warm skin against cold skin, he explained, is the most efficient way to bring heat back into a body that has lost its core temperature. And as for frostbite — "If you see your buddy's nose turning vhite and vaxey, for heaven sake don't rub it! You vill have two noses . . . one in your hand! Lukevarm vater at about 100 degree is the only safe way to treat it."

—Snow Camping

•

Caveat Emptor, be wary of discount store poles, poles made in Taiwan, and poles from a nonexistent plant in Scandinavia. There is a definite leader in nordic pole production and quality: Liljedahl of Norway, Jofa, Scott USA, Sparta, and Moon also make reputable products.

—Nordic Skiing Gear

Skate sailing

You rest this thing on your windward shoulder, stand on ice skates on an icy lake, and there you are, sailing 40 mph across the winter afternoon.

—SB

Icicle skate sail
$79 - $89

from:
Waterfun, Inc.
Box 3442 Ridgeway
Stamford, CT 06905

Nordic Ski Patrol

Dear Co:

The Nordic Ski Patrol. The National Ski Patrol System, Inc. now has a Nordic part to go with the Alpine part. They are affiliated with United States Ski Association, National Safety Council, and the Advisory Committee: U.S. Army; on Mountain and Arctic Warfare. Mostly NSPS is a service organization, specializing in helping skiers in distress. The Nordic SP concentrates on accident prevention. Search and rescue is harder, usually, with Nordic than Alpine, because x-c people ski far from roads and civilization, and the consequences of an injury or an error in judgement under those circumstances can easily be fatal, i.e., hypothermia.

The Nordic program of NSPS began in 1968, when Dave Hedgdon, now National Nordic Advisor and Director of the Eastern Division, started the first Nordic Patrol. This season, 1974-1975, the program went national, and is growing fast.

To join, you need to be an intermediate level skier and be enrolled in or have completed a Red Cross "New" Standard or Advanced First Aid Course. Then you sign up to attend one First Aid refresher clinic and one ski and tobogan clinic, in your area. After successfully completing the clinics you are a Candidate patroller, which means for the first year you cannot work alone, but must work with a certified patroller. After a year, you become a full fledged patroller, and can work on your own.

The work is patrolling nordic skiing areas, assisting organized tours, and search and rescue, if needed. On tours and in touring areas, you help people who have equipment or first aid troubles. You also help NSPS by filling out accident forms, so they can determine the most frequent accidents and their causes and try to do something about them.

I will mention some things that I think will help people interested in joining.

Be able to ski downhill pretty well. The things they had us do in the ski & tobogan clinic I attended were: side step, star turn, kick turn, kick turn on the side of a steep hill, traversing, herring-bone, snowplow, snowplow turns to the right and left, slowing your descent by dragging both poles outside the right leg, then outside the left leg, then between the legs. We were on a very steep hill with little snow and lots of rocks and sticks (typical eastern conditions), and when I tried to snowplow, I hit something, fell forward, and hit my knee hard on a rock ripping my $20 knickers and putting me out of the rest of the downhill stuff. (I also couldn't run for two weeks after that.) I had control problems because I wasn't too proficient at downhill skiing, and because of my ski boots. So if you go to a ski & tobogan clinic, be able to control your skis downhill, wear old clothes, take old skis – rent some, even – and take aluminum poles, or extra bamboo ones. One guy broke a pole. And for ski boots, the ones with injection moulded polyurethane soles are next to useless because they have no lateral stability, so you can't turn your foot and have your ski follow. And those aluminum heel plates that are supposed to grip the heel of the boot so you can turn the ski while going downhill are no good either. The only answer is to buy good boots (Alfa are the best) with leather, rubber coated leather, or rubber soled boots. Rubber not plastic! If you do have plastic soles and aren't getting control, you can buy the heel plates to the new defunct Eie binding, they are a pyramid shaped piece of metal mounted with two screws, and cut a notch in the heel of your boot so when your heel is down on the ski the pyramid will stick up in the notch and keep your heel from moving. I did this to my boots and it works. Eastern Mountain Sports [EPILOG p. 659] has the heel pieces if you can't find them locally. Be careful cutting your boot, if you can, find an old Bass boot with the notch in the heel (made for the Eie binding) so you have a model to work from. Bass boots are not Nordic Norm – they only work in Eie bindings, and they suck. That's why they are no longer made.

If you can, go to a library and look up belaying techniques under mountaineering safety. We had to lower and raise a tobogan with victim down and up the side of a steep hill safely, which means don't let go of the rope. There are a few knots you need to know, and there is a set of signal words like "off belay" that you should know. The signals are standard and tell everyone what's going on and what you, as belayer, want done.

Also in the mountaineering safety book, look up how to make an emergency tobogan out of your skis. Another reason to take junky or rented skis. You need some knots and ingenuity. And be able to light a fire with two matches.

The clinics and the ski patrol are worthwhile things, especially from the standpoint of self-survival. I also learned about all the poorly made and accident and injury causing equipment on the market because of the x-c boom. And after you've been in a while, there are avalanche and mountaineering safety courses you can take with NSPS. Very valuable if you live on the snow at all. Every x-c'er should join, in preparation for the next ice age. Write to the national office for the name of the division leader in your area, and ask for a schedule of the clinics. Thank you.

Sincerely yours,

Thomas A. McCarey
"Joe Ski"
Berwyn, Pennsylvania

Nordic catalogs

Joe Ski recommends three.

Nordic Trails
255 Jayne Ave.
Suite 301
Oakland, CA 94610

Nordic Trails has a humble just-the-facts catalog and unusual equipment – including roller skis ($53) for summer x-c training, which no one else has. Friendly thorough service.

Nordic Traders Inc.
Little Pond Rd.
Londonderry, VT 05148

A nice catalog. At the shop they have 25 mi. of trails for trying out whatever.

Great World Inc.
250 Farms Village Rd.
Box 250
West Simsbury, CT 06092

"The Great World of Ecology Sports," they call their catalog. Includes x-c, hiking, canoeing, biking. Some unusual items.

–SB

Communications

THE REACTIVE ENGINE PAPER

BY TERRY WINOGRAD

This paper, written in October of 1974, originally appeared as a file on the computer at the Artificial Intelligence Laboratory at Stanford University where Terry Winograd is currently leading courses in computer science, linguistics, and the social implications of computing. At the time of writing the people at SAIL were discussing how to design their new timesharing system. Another file was also maintained on the system in which comments, suggestions and objections could be stored. It is an argument for personal computing – not an essay, but a sort of cybernated commentary.

–Marc Le Brun

NOTE:
This is written in an attempt to provoke discussion, so it may overstate, exaggerate, etc. It is written from the viewpoint of the Ivory (silicon?) tower, so the issue is "What is possible?", not "What is now practical?" After all, working at the AI lab you would never realize that there are still people in the world (even at Stanford!!) who talk to computers by cutting little holes in pieces of cardboard.

WHY TIME-SHARING IS OBSOLETE:

Time-sharing is obsolete because it is based on the assumption that a person interacting with a computer large enough to do serious work cannot make good use of its computing power except during a fraction of the time.

GEDANKEN EXPERIMENT:

Imagine that by a decree of God (or ARPA or whoever) we were only allowed to run one user at a time on the PDP-10. All the systems efforts would be directed to making each person's time on the computer as profitable as possible. What kind of system would you organize?

REACTIVE SYSTEMS:

I will borrow a term from Alan Kay (from whom I have also absorbed many of these ideas) to contrast our current "interactive" system with an imagined "reactive" system. A reactive system contains a full-scale processor whose only job is to cater to a single user. It can therefore afford to do relatively large amounts of processing when he or she is doing the simplest of tasks, like editing or giving monitor commands. It can maintain complex reactive graphic displays in real time (e.g. the multiple windows in the current SMALLTALK system).[1]

CLAIM:
The advantages of a reactive system over current interactive systems will be as large as the advantages of interactive over batch.

NATURAL COMMUNICATION:

One of the main advantages of a reactive system is that it can afford to do extensive processing to figure out what the user wants to do, based on both what he or she says and what the current context is. This is the main feature of natural language as a communication system – it is designed (evolved) with the assumption that the hearer will always make use of context and a shared base of knowledge in his interpretation. People are much more efficient at communicating in this style, regardless of whether it is in actual "natural language" or in some artificial language. There are lots of bits and pieces of this in current systems – everything from default file extensions to command completion to the rather extensive set of facilities (like spelling correction) in INTERLISP.[2] On current interactive systems there is a strong tendency to avoid these because they involve running a higher-level program to interpret inputs. With

a reactive system, the bottleneck is the user's typing speed (although we could even imagine some sort of simple voice inputs if we pushed this idea far enough), so we can afford to do lots of processing.

REMEMBERING AND DEDUCING:

Often the problem isn't that we want to specify a command in a way which needs a smart processor to understand what it is, but in a way which takes a smart processor to do it. If we were talking at the command level to a program with even limited deductive capabilities (the kinds now put into robotics programs) it would free us from much of the tedium of converting our desires into "machine code." Why shouldn't we be able to say in some language "put the current who display in a file" and let the system worry about the details of just what needs to be run.

The whole range of things like UNDO, REDO, etc., which are creeping into languages like INTERLISP could be extended to cover every aspect of our communication with the computer – it could remember the context of what we have been doing, and make the necessary deductions to do rather sophisticated things (e.g., redoing some sequence of actions, but tailoring it to apply to a different kind of data object).

EDITING: **Maxim: People Never Edit Character Strings.**

Whenever I am editing, I am editing a document, a message, a program, or some other structure about which I know much more than the simple sequence of characters. The reactive system should always be dealing with my editing in this way. Formatting systems for documents should be interactive and incremental – what I see on my screen should always be what I would see on the Xerox Graphics Printer when I put it out. This includes fonts, justification, diagram placement, etc. etc. Of course the program should be able to reconfigure and modify this in a whole variety of ways, but I should always be working with a document, not a source file (or even a screen-editor!) When I put in a new word or line, things should move to make room for it. Things like spelling-checking could be done incrementally, looking up each word as it is typed in, then when I ask for it, interactively pointing out those not in the dictionary (e.g. by flashing them) and letting me make changes. For programs, the editor should be part of an integrated programming and debugging system (as in INTERLISP), not a separate program at all.

PROGRAMMING AND DEBUGGING:

We have glimpses of integrated systems in SMALLTALK, INTERLISP, ECL[3] and Swinehart's thesis[4] describing a SAIL-based system. Often these are forced into horrible compromises by the fact that they are walking the line between wanting the user to have the full power a program can offer at each step of the way, while having to run them on time-sharing systems which are based on the assumption that you really only want to process part of the time. They fall far short of putting in the kind of integrated knowledge-base and deductive programs which would really allow the system to act as a programming assistant. They do not make full use of the possibilities for incremental compiling (coupled with the editor) which can give the user the feeling of always working with an interpreted system, while actually having the efficiency of careful compiling. They are only beginning to make use of the kind of graphic interactions which can greatly broaden the programmer program bandwidth. I have

ranted about this elsewhere[5] so will say no more here, except to note that this is probably the most important area where reactive systems will change our concept of programming.

IS IT WORTH IT?

The same could be (has been and still is) asked about interactive computing. Ask the programmer who has become accustomed to an interactive debugging system and then has to go back to octal (or hexadecimal) dumps. In the short run (and we are always in the short run) this is a difficult question, and I will take the escape given above – it is certainly worth it if our research grants will support it. In the long run I don't think there is any doubt. The costs of processing, memory, etc. are going down and although there may be ultimate limits, we are still far from them. Anything which trades off increased processing for increased ease of computer use by people will be eventually justifiable on practical grounds. Twenty years from now this question will be as outdated as it would be to ask now whether it is really worth having the computer go to the work of accepting programs in symbolic form, since people are perfectly capable of converting them to binary numbers and entering them that way.

CAN IT BE DONE WITH CURRENT TECHNOLOGY?

Researchers at a number of places (including XEROX and MIT-AI) are currently designing and building "personal computers" which have a processing power far beyond standard minis or "smart terminals." In fact many of the ideas above are being implemented at Xerox. By connecting these into a simple network with shared facilities for things like specialized I-O (XGP, A-D and D-A, ARPANET, etc.) and large file storage (allowing file sharing), these computers could currently provide everything we get from a time-sharing system, while opening the way to all of the advantages of reactive systems. At the moment, the cost per user (even if they were commercially available – which they aren't) would be significantly greater than an improved this-generation time sharing system of the kind being planned at SAIL. However the picture is not that clear if we look ahead the 3-5 years necessary to actually get systems running. Careful thought needs to be given to realistically assessing what hardware will (or could if we put effort into it) be available by then, and how much it will really cost.

WHY SHOULD WE CARE?

This paper was circulated only partially because there is a general interest in talking about systems. There are particular reasons to think seriously about these issues now. AI researchers (particularly John McCarthy) have always been at the cutting edge of new systems ideas (like time-sharing, list processing, etc.). In this case I think we have even more to offer, since many of the techniques which are needed to build reactive systems are "AI techniques" involving knowledge bases, deduction, etc. We have the option of taking the viewpoint of "wiping the slate clean," thinking in terms of what we would really like to do with the new technologies, rather than incrementally building on the ideas and equipment now available. Even if the appropriate personal computers were not available right now, much of the design and debugging could be done on current systems if we had a clear idea of what we expected from the hardware.

PUNCH LINE: I believe that reactive systems are "where it will be" a few years from now, and we have the choice of leading or waiting to follow. ■

REFERENCES

1. **Personal Computing** by Alan Kay, Learning Group, Xerox Palo Alto Research Center and **A Personal Computer for Children of All Ages** by Alan Kay, ACM National Conference, August 1975.
2. **INTERLISP Reference Manual** by Warren Teitelman, Xerox Palo Alto Research Center.

SYSTEM INCOHERENCE

BY MARC LE BRUN

Computer systems are *environments*, or, if you prefer, *ecologies*. They have a past and a future, functional niches, finite resources and many other properties associated with complicated systems which occur in nature. Yet, few installations take this fact into account as a general policy. As a result the systems are subject to the same sorts of degeneration caused by neglect (or out-and-out rapacity) as their more organic counterparts.

A typical (and costly) result of this is that it takes at least as much effort to instantiate a process on the system as it did to produce the original solution design in the first place. I am not referring to the usual tooling costs incurred in any engineering venture, but the unnecessary aggravation caused by attempting to use a polluted resource.

Ultimately, I suppose, the blame for this lies with conventional attitudes towards the world around us, but in the short range I believe it is because system "health" is never budgeted for, which in turn is because it is not perceived as a "real" property of the system, even though it can account for tremendous losses in time and efficiency.

Installations are in general enslaved to the past and irresponsible of the future. An all too common scenario goes like this: (1) Project A writes some software, completely with self-use in mind. The software is not "clean," but was only intended to "do the job," and has various strange and peculiar side-effects, which however, are of no concern to Project A. (2) After a while Project B develops a need for some similar software and to "cut costs" uses Project A's. The side-effects, while inconvenient, are easily managed. (3) Projects C, D, E. . . follow suit and soon the software has become The Software. (4) Finally, Project Z comes along. Project Z is fantastic, worthwhile, very useful and promises great things for the future except for one thing: the side-effects from The Software are pure poison to it – and the system has developed it's first allergy. On older and larger systems *every* new project is like "Project Z," there's always some major or minor implementation conflict.

I once did some low-key work on a system that had to meet some "crash priorities" and was under tremendous pressure to justify its continued exitence. The main systems group began to modify key portions of the software to expedite their job and help meet deadlines. Less than vital projects had to fend for themselves as various parts of the system ceased to function reliably. Eventually of course, they painted themselves into a corner, since their own software began to fail, and the system had poisoned itself with the metabolic byproducts of its own too-rapid growth.

I believe that this kind of nonsense may be greatly reduced by a little planning at the start, and, in particular, budgeting for the maintenance of system health. Systems do get old and cranky and die of course, but a lifetime of "sickness" is another thing entirely. ■

3. **The Treatment of Data Types in ELI** by Ben Wegbreit, Communications of the ACM 17, 5 May 1974.
4. **COPILOT: A Multiple Process Approach to Interactive Programming Systems** by Daniel Carl Swinehart, Stanford Artificial Intelligence Laboratory AIM 230.
5. **Breaking the Complexity Barrier (again)** by Terry Winograd, ACM Sigplan Notices 10:1 January 1975.

Box 428, Sausalito, California 94965

Brigadier General Sampson was the man in charge of the Pentagon's Command Center when the Mayaguez Incident hit. In the parlance, he was DDO (Deputy Director for Operations) of the NMCC (National Military Command Center) on the 2200 - 0600 shift, 11 May 1975.

I would never have attempted this interview, and General Sampson would never have granted it, if we didn't have a couple things in common. One is his wife Clare, my redheaded older sister. The other is a mutual regard for the U.S. Army.

Don gave me a tour of the Command Center while I was visiting his family this Spring, along with an account of what happened during the Mayaguez, somewhat different from the standard newspaper reports. "So tell it straight," I said. "Nobody would be interested," he said. "I would," I said. "But no one would print it," he said. "I would," I said.

A weekend later, Alan Ternes, editor of Natural History, *predicted dryly that the interview would never see print. "He'll tell what happened, and the Pentagon will stop it for not agreeing with the official story."*

The facts in this interview are not different from the familiar story, though the perspective is. The piece has been reviewed by officialdom and made somewhat blander than it was originally, so as not to trespass on the forthcoming Congressional investigation of the Mayaguez Incident. Strictly a matter of tone – they removed the questions that Don couldn't answer or that he had incomplete information on. They were generous with photos, with time, and with patience on their side of the mutual mistrust between military and press these days.

If Don's tone sometimes sounds tight, imagine yourself simultaneously giving an interview for publication and keeping military secrets. It's an exercise equivalent to juggling one orange, one bowling ball, five ping pong balls, and an open straight razor. Never graceful.

But even less graceful has been the criticism of the Mayaguez that I've read. It's consistently sloppy – all attitude and little research. Complaints that the news of 23 killed in a helicopter crash was held back. (It was in the New York Times *immediately.) Complaints that the Mayaguez was told of hazard in the area and so deliberately sent into trouble, and complaints that officialdom deliberately withheld warning so the ship would steam into trouble. (You can't have both.) Complaints that our behavior with the Mayaguez was inconsistent with our recent seizing of a Polish fishing ship and with South American seizures of our fishing fleet. (There's no comparison. Foreign fishing in territorial waters is a legal trespass, subject to legal arrest. A standard diplomatic hassle. The equally standard "right of innocent passage" should have protected the Mayaguez in Cambodian territorial waters – she was neither fishing nor fighting.)*

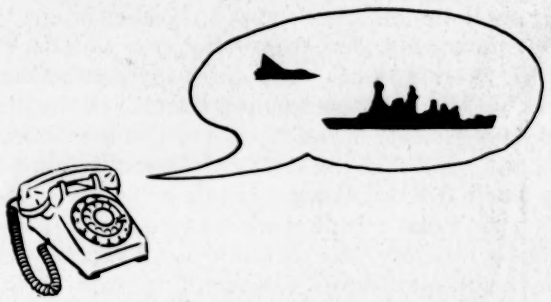
I have a complaint – that it was never made clear what was the point of the air attack on the oil depot on the Cambodian mainland after the Mayaguez crew was recovered. Was that a military objective or reprisal? General Sampson can't say. I trust that Congress will ask someone who can.

The important comparison is with the Pueblo incident off North Korea in 1968, the fiasco that inspired the present organization of the Command Center. This time response was quick and coherent. Adequate forceful response to force, and surprising restraint. And luck.

There are almost no names in this interview. The Command Center is a configuration of roles and responsibilities designed to handle national emergencies from a few-minute missile attack notice to you-name-it. How it works is consequential, and also interesting in its own right. How would you design a command center?

–SB

BRIGADIER GENERAL
DONALD SAMPSON
ON THE PHONE



From the Command Center: THE

Stewart Brand: How did the *Mayaguez* incident start for you?

Gen. Sampson: It started for me when a May Day message was relayed from our Embassy in Djakarta, Indonesia and appeared on my desk, after 5:00 in the morning, May 12. It was a very simple May Day message and it had been retransmitted word for word, I presume, from the original message that had been received by the parent company of the *Mayaguez* there in Djakarta. It said words to the effect that, "May Day – we have been fired upon and boarded by Cambodian navy personnel and are being escorted against our will on course so-and-so heading so-and-so."

SB: Then what happened?

Sampson: Well, my first reaction was, "My God, Cambodians? Get serious!"

SB: I'm a little curious how that May Day message came to you, and how long it took to do that.

Sampson: Well, I can tell you that exactly because of a rehash that we've run. The ship sent its original May Day at about 3:18 in the morning. Now all these times I'm giving you are Eastern Daylight Time, and you'll have to go back and interpolate the time zones to suit yourself if you want to go that far into it.

SB: Am I correct it's an 11-hour difference?

Sampson: I'm not sure. (In my office I have a time-conversion chart, but don't have one here at home.) At 3:18 in the morning, we are told, the ship sent the May Day. It was received by the Delta Exploration Company in Djarkarta, Indonesia. And from 3:18 until about 5:00 in the morning, the company tried to recontact the ship. At along about 5:00, they found out that they couldn't, and they gave up.

MAYAGUEZ INCIDENT

Destroyer Escort Holt alongside the merchant ship Mayaguez after recapture at Koh Tang Island May 15.

At that point they notified the U.S. Embassy in Djakarta of the incident. And we're told that about two minutes after 5, the American Embassy sent a message to Washington notifying us of the incident. Now, I don't know at this point to whom they sent the message or precisely by what electronic path it finally wound its way on my desk.

[Here follows one of several afterthoughts on the interview by General Sampson.]

The essential point here is that the message did not enter the U.S. military command/control/communications system until it arrived at the NMCC; to put it another way, our responsibility for coping with the situation began at that time.

So I got the message, and I'm scratching my head. My function is to be alert and to have a team that is alert to this kind of thing, and then be able to decipher, make a short-term corroboration of the message or incident, whatever is presented to us, and then proceed without delay to notify the people who need to know about the particular incident in order to place the decision-makers at the decision-point. So for about the next half an hour or so we did just that. We had conference calls, and compared notes with people from the intelligence community, the State Department, and the Pacific Command Post.

SB: This is how many people at your end making calls?

Sampson: At the Command Center? Three or four. Those who were most directly involved with the Pacific Command. Of course, we have a desk officer for each major area of the world, and it's the Pacific desk officer that was doing most of this. He was doing the routine type calls, and I was talking to principals of one kind or another. My effort at this point was: to corroborate the report if I could and to find out what assets were available on the scene that we could apply so that when I began informing principals, they'd have something to act on. And that's what happened.

The term "principals" as used here, refers to high-ranking military officers (Lieutenant Generals or higher) and the top civilian authorities (or their aides) in the Department of Defense, the Organization of the Joint Chiefs of Staff, and other agencies of the Executive branch of government.

SB: So you're already starting to do that at the same time that other guys are trying to corroborate the information.

Sampson: We were working together, each one of us calling different sources, combing the woodwork as it were, to see if there were any corroboration of the story or if anyone else could shed any light on the incident.

SB: What did you find?

Sampson: We found no corroboration. There was simply nobody in that area that we could put our finger on, that could go out and look and say, "Yeah, it is true," or conversely, come back and say, "There isn't a ship there."

SB: Do you get false alarms like that?

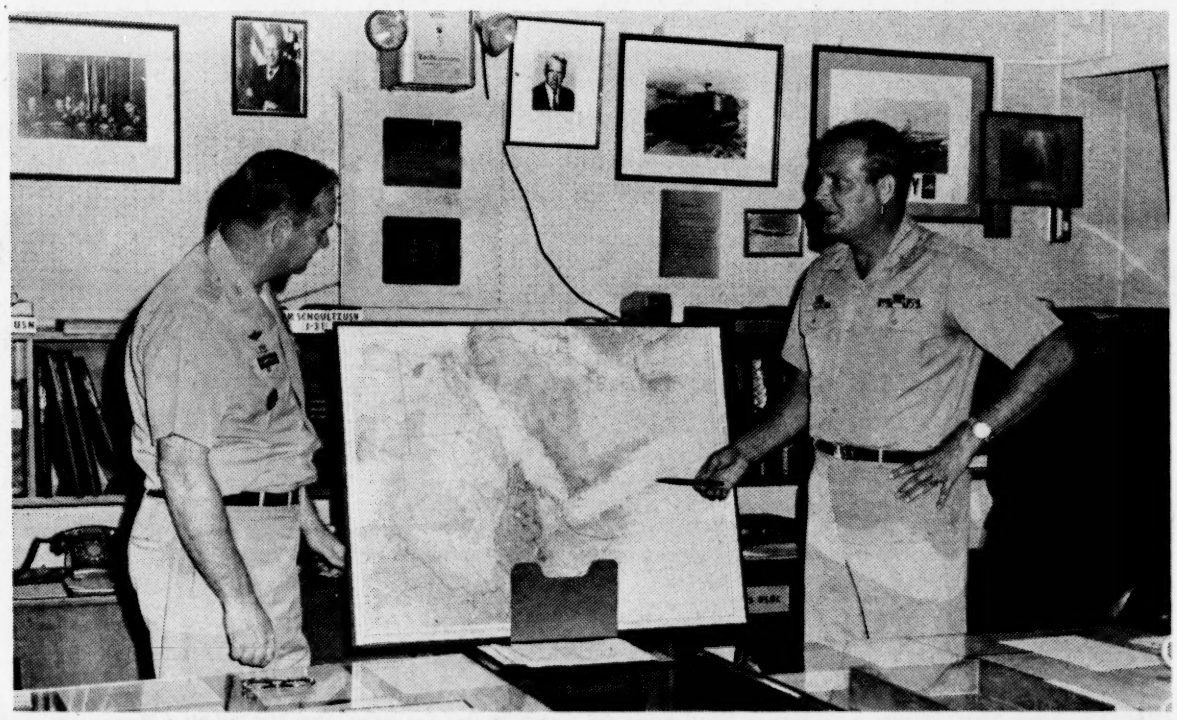
Sampson: Oh, from time to time. You'd be amazed at some of the calls we get.

SB: Any you can tell me about?

Sampson: Oh, I suppose I could tell you about one because I don't have to identify the individual. From time to time we get prank calls from an individual, one in particular — there have been others — who identify themselves as various Washington principals. Like he'll call up and say, "This is William Colby. How about telling me the latest on so-and-so." And we in very polite terms usually say, "Well, Mr. Colby, that's very interesting. You're a little out of channels, but I'm sure you're authorized to have access to that. If you'd just please hang up I will call back through my regular sources to your home to make sure that we have a good connection." And at that point he hangs up. That sort of thing.

SB: How about false information coming out of some incident or other?

Sampson: That's a pretty off-hand question that I shouldn't give you an off-hand answer to. Let me say that there's all kinds and types and varieties of information flowing in, and we live in an imperfect world, and not all of the information that comes in is necessarily accurate. So one of our functions, of course, is to do the best we can to verify it in a timely fashion. *[more →]*



W.C. O'Neill

Gen. Sampson (right) and Col. Hammonds (left) in their Command Center office. Col. Hammonds, as assistant, monitors calls coming to Gen. Sampson to be sure they're understood correctly. Should my brother-in-law become deranged while on duty, Col. Hammonds replaces him.

SB: Well, as you know, this is my interest in your operation – how one handles and judges the quality of information.

Sampson: Oh brother, that's a toughie, because it all comes into the category of judgment. You just used the correct word. You try to get people around you to assist you to make a proper judgment.

SB: Define, maybe in terms of judgment, your role when you're on at the Command Center.

Sampson: Well, my role is the same as military commander in a situation. I'm responsible for everything that goes on in the Command Center. The team has been organized, not by me, but has evolved over the years. It contains various kinds of expertise in a very close-knit team-type activity, so that we divvy up the responsibility, and we can also bring collective heads to bear, on a very short notice, in a given crisis situation.

SB: How large a team is this?

Sampson: About 25 people.

SB: On at a time?

Sampson: Yes.

SB: And the rotating group over all is how many?

Sampson: There are five such teams. It takes that many to man the Command Center 24 hours around the clock continuously and still give some kind of refresher break between team stints . . . plus have an immediate back-up capability to expand the Command Center if an instant crisis should arise. There are normally two teams on break at a given time, and one of those is always designated as a back-up team, and they're on call. They must be locatable within a very short period of time.

SB: What's your work cycle there?

Sampson: We work six days on and theoretically four days off. Every time we go back on a six-day cycle, it's at a different shift period.

SB: How long are shifts?

Sampson: Eight hours, plus overlap times. We're in there continuously for eight-plus hours.

SB: Sounds a little like Airport Flight Control people.

Sampson: From what I've seen of their operation, it's not dissimilar.

SB: Back to *Mayaguez*. You got this message on your desk and are making phone calls.

Sampson: Well, I exited the scene very shortly thereafter, because I was relieved very shortly after this. But before I was relieved, I made the initial notification to the Washington principals that I thought were most in need of that information.

SB: Are you going down a contingency list at this point?

Sampson: Yes, we have a number of such lists to assist us, they're kind of memory-jogging devices. Some of them are called Fast-Reaction Procedure Cards, where we have thought out a given crisis-type situation well ahead of time and away from the heat of an actual crisis, and written out check lists of actions we should perform. These prove to be very helpful, because when you're under the pressure of an actual crisis, you're not going to think of everything you should. A good example is an aircraft hijacking.

SB: You guys get those as well?

Sampson: We get involved in those for a number of reasons, but the principal reason is because of the excellent communications we've got. If there's an aircraft hijack over the United States, we can instantly conference the FBI, the Federal Aviation Agency, and various elements of the continental air defense command in order to bring all of the radar and such devices to bear.

SB: Are there other non-military communications problems that you get involved in?

Sampson: There are so many I couldn't even single out an example. People use us often, and of course, this pleases us because as long as the capability exists we're very pleased to see it used.

SB: Well, I'm curious. What are some of the things you get into besides hijacking?

Sampson: You mean in the strictly non-military field?

Reconnaissance photo of Koh Tang.

SB: Uh huh.

Sampson: Well, you know, that's about the only one I can think of that's non-military oriented, except for assistance in long-distance communications from time to time for various other government officials.

For some reason, I drew a blank when you asked that one. Some other good examples would be providing coordination and communications assistance in disaster relief operations and disseminating emergency weather warnings through the military communications system.

SB: Well, back to your contingency list. So part of your function is to pick which one of those the given incident fits?

Sampson: Not so. No, that makes it too mechanical. That's a poor portrayal of what happens, because the majority of things that happen we could never in the world have conceived of before. There's no way to write a check-list for something that you haven't foreseen. That's where judgment comes in. Who would have predicted that we would have a piracy at sea at that given time, especially by Cambodians? And so the thing is purely judgmental. Now we do have lists of people that we are to notify, but by the time you're in the job for any length of time, you have that memorized. We know precisely who we should notify.

SB: So what was your judgment on the *Mayaguez* message?

Sampson: You mean as to who to notify?

SB: Well, yeah, what was the quality of its seriousness, and who did you notify?

Sampson: Okay, let me answer the first part first, and the last part by saying I'm not going to tell you.

SB: Okay.

Sampson: Because I really can't tell you in that case who I notified. That would give away some of the operating procedures which we don't really need to have public. There are a number of people I must notify, and in this case, I made the judgment as to which ones needed the first notification and accomplished that before I was relieved and I went home. Okay, now to get back to . . . .

SB: The seriousness and the quality of the information.

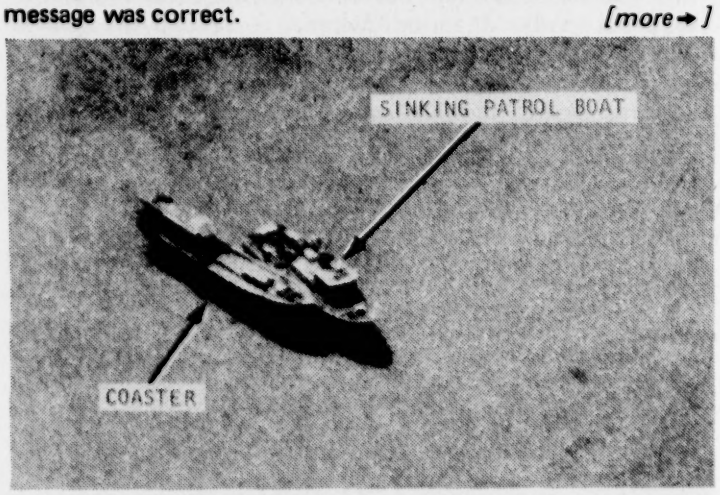
Sampson: All right. By the time I made the notifications, there's no way we could have verified the information. But I had already started certain military activities in motion, requested that it be done at least, at the Pacific Command headquarters, and so notified the principals when I called them. And I simply went ahead on the assumption that even though I didn't know that the situation as reported was true, this was potentially serious enough that I must bring it to the attention of certain people.

SB: The military calls, this was what? Placing units on alert or something?

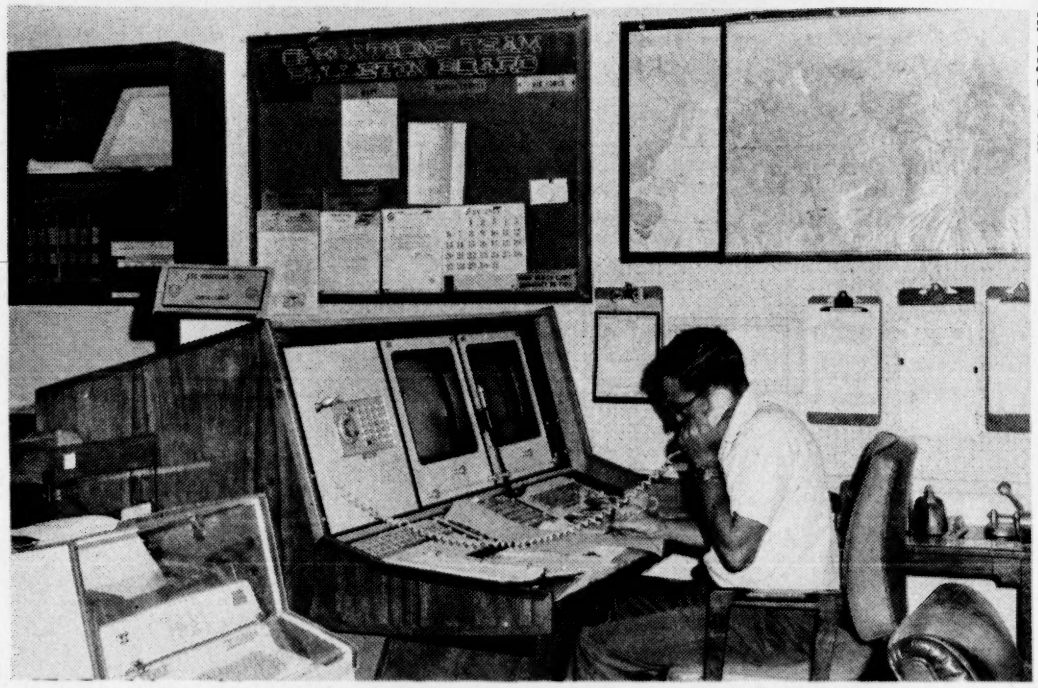
Sampson: I really can't say. Well, yes, let me say this, that the principal thing I was concerned with was getting some kind of reconnaissance vehicle in the area as soon as possible in order to either verify or put the lie to the story. Remember, we're talking about the Pacific Ocean, vast thousands of square miles, and we simply can't cover it all. And we had nothing in that specific area when this occurred.

SB: How specific a location did you have on it?

Sampson: We had a latitude-longitude indicated in the message, so we knew where to start looking, assuming the message was correct. *[more→]*



In the Gulf of Thailand one of the Cambodian patrol boats sinking on May 15.



W.C. O'Neill

The Surveillance Console in the Command Center, manned by Lt. Col. Anderson. These photographs were taken July 3, 1975.

SB: The lag times were what here? You got the message around 5:30, and things were moving how fast and how wide?

Sampson: Well, let's put it this way. I left to go home about 6:30, and all the notifications that I felt needed to be done had been done by that time.

SB: Shall we continue with the incident as you know about it beyond your period there?

Sampson: Well, if you like, and as long as you understand that I'm going to confine my comments to just what is a matter of record and/or eye-witnessed in terms of my function – which is to keep the lines of communication open, and to exercise the command and control system, and provide that kind of service to decision-makers.

SB: OK, run that down.

Sampson: OK. By 7:30 reconnaissance aircraft had been directed to launch and find the ship. Subsequently the ship was located and from that point on we had it under continuous surveillance. Now we're on the 12th of May. Things began to get a little interesting later on in the day, because around 9:15 in the evening, one of our reconnaissance planes was fired on by a Cambodian gunboat that was with the *Mayaguez*. It was struck, but there were no damage and no casualties. And during that same day, decisions were made to dispatch various kinds of forces in that direction. Now bear in mind, we're witnessing a developing situation. No one knew at this time precisely what the outcome might be. So what you see during that day are a number of actions designed to be ready to cope with whatever might develop. And along about midnight on the 12th, we got a report that the ship was moored near this island, Koh Tang Island.

Then on the 13th, instructions were given to maintain fighter and gunship coverage continuously over the area where the ship was moored. It was very important to do that at that time, because if you'll recall the *Pueblo* incident, by the time any reaction could have been made, the *Pueblo* was already inside a North Korean harbor. And once a ship gets in that kind of position, then you're faced with a very messy set of military alternatives to try to extricate it. As long as it was moored well away from the mainland, well outside the harbor bay, we had it relatively isolated, which presented a much simpler series of military options for any attempt to go and recover it.

SB: Can you say who's handling those kinds of decisions?

Sampson: The point here I would like to make, is that the decision making process was very, very smooth and even and well handled, and I am qualified to comment on that.

That answer sounds like a cop-out, which it wasn't meant to be. I simply don't want to be put in the position of either being seen as an intimate part of, or revealing even if I know, the details of executive-session deliberations by very senior and responsible people. Those conversations are privileged, in the same sense that legal consultations (or conversations with your secretary!) are privileged. The individual who is insitutionally responsible for making high level decisions and recommendations to the President is the Secretary of Defense. His top military advisors are the Joint Chiefs of Staff, assisted by the J-3 (Director of Operations, Joint Staff) and the Operations Deputies of the four services (Army, Navy, Air Force and Marines).

SB: Is that a large group of people or a small one making those decisions?

Sampson: Well, the crisis-handling organization or system I think is pretty much a matter of public record, at least at the executive department level, because there are certain people that gather, who are the President's most trusted advisers, and who form a very small select committee. That, of course, I'm not going to comment on further, because all I know about it is what I read in the paper. I'm never involved in the White House. But there's a similar type organization and system set up within the Joint Chiefs of Staff. You can well imagine that for the people who really have the responsibility for making decisions, we have a system set up whereby they can be notified and should they decide to gather, then we can provide a place for them and all the communications and other kind of support they would need.

SB: Are these people then located at the Command Center doing this or located elsewhere?

Sampson: They could be located any number of places. In this particular instance, they were in the Command Center.

SB: So you had a crowd of people there for several days.

Sampson: I wouldn't say a crowd. It was a manageable number. Just those required to make the decisions and represent all the expertise in the services.

SB: Did this include the President?

Sampson: Uh, no. Not in the Command Center. Communications capability existed for instant secure communications between the senior individual in the Command Center and the White House at any given moment.

SB: OK, we're into the 13th and . . .

Marines landing on Koh Tang May 15. The CH-53 "Jolly Green Giant" helicopters landed 200 Marines in two groups.

Sampson: We're trying to isolate the ship. We're trying to keep it from getting into the mainland. And during the day there are a number of small boats, that are observed moving from the mainland out to the ship, and between the ship and the island. And because of various hostile actions, a patrol boat was sunk at about 8:20 PM. During the day, the same type of actions that I alluded to earlier took place; that is, gathering forces together for any kind of contingency that national authorities here might decide to implement. Helicopters were gathered together at a central point from a number of different locations.

SB: That would be the Thailand Air Base. I'm just reading the New York Times here. "1100 Marines flown from Okinawa."

Sampson: That's a pretty accurate report. And by the same token, a force of Marines was gathered together from various locations throughout the Pacific Command. This is a precautionary idea, and I think a very prudent one, because it preserved a number of military options. Remember at this point that a decision still had not been made as to what precisely to do. And during the remainder of the 13th and the 14th, most of the 14th, efforts still continued to prevent the ship from leaving the island in the event that diplomacy failed.

SB: This is the ship they're trying to move, or just gunboats steaming around?

Sampson: No, to prevent the *Mayaguez* from leaving the island. Now based on the reports we had at that time, we weren't sure where the crew was. It was very difficult to tell. There had been a number of boats running back and forth, to and from the ship, there was a report at one point from an aircraft that a boat was seen going toward the mainland with what appeared to be Caucasians on board. But that's not really the kind of report that you want to hang your hat on as being absolutely true. So, the decision makers were faced with a pretty tough proposition. We knew where the ship was, and the best indications were that the crew, or part of it, was on the island. We weren't really sure what kind of action to go about attempting without endangering the crew, so it was a tough and sticky decision . . .

SB: Give me some idea of how you and the Command Center are doing through all of this.

Sampson: Well, as the higher ranking people began to gather, the chief decision makers, our role was a transition one. Instead of being the guys making decisions and informing people, we then become those who support the decision makers by assisting them with whatever communications support they need. Obviously, clerical and administrative support, and the preparation and dispatching of whatever messages are needed to implement the decision. In addition to taking care of many satellite and lesser important phone calls for them. So our role becomes one of support.

SB: So if they're trying to consider options, and they're saying "Can we have so-and-so on hand?" you would find out if they're on hand?

Sampson: That would be the kind of question they might ask us to take care of, yes. But I hope you understand that those of us who man the Command Center are quite junior compared to those folks, and we're not involved in the decisions themselves.

SB: I'm real curious what shape you were in when you went home at 6:30 Monday morning.

Sampson: The first day? I was still scratching my head, frankly. I could imagine the potential gravity of this situation if it were true. And I'll tell you why, if you don't mind a personal opinion.

SB: Do it.

Sampson: I'm not really an historian, but I'm something of an American History buff, at least in terms of international relations. And it seems to me that there's a constant thread that really stands out in the history of this country, in the overall fabric. And that is that we become very emotional when it comes to piracy on the high seas, and it affects our ships. The Marine's hymn: "From the Halls of Montezuma, to the shores of Tripoli." Well, the shores of Tripoli were the Marines landing to take care of the Barbary pirates which I think is the same time that some great statesman said, "Millions for defense, but not one cent for tribute." And we got very unhappy about the *Pueblo* being captured. The item that precipitated the emotions for entering World War I was the sinking of the *Lusitania*. The Japanese come and sink the ships at Pearl Harbor and this causes a tremendous emotional reaction in the country. Well, to me it was very obvious that the collective reaction of the people of the United States was going to be, "Get that ship back." And so I could see a small problem coming up, depending on how the situation might develop. That's what I was thinking about.

SB: This might be the point to connect the origins of the Command Center with the *Pueblo* incident.

[more→]

W. C. O'Neill

Emergency Action Element in the Command Center. Left to right. SMS K.L. Swinson, USAF; SSG S. Sutara, USAF; CDR D.J. Walter, USN; and LTC J. Smallman, USA. The night I visited, a quiet night, the TV monitor was showing "M.A.S.H."

Sampson: Well, there always was a communication system, of course, but there was a sharpening of the idea of a Command Center following the *Pueblo* incident.

SB: Why?

Sampson: Well, since I wasn't there, I really can't give you an authoritative answer, but I think we can presume that the way the initial information was handled and the way the communications existed, and the way the procedures were – that improvement was needed.

SB: Do you have any idea what the information problems or the time problems were?

Sampson: I really don't, cause I obviously wasn't there.

SB: Presumably you're around people who were seeing how the Command Center performed around the *Mayaguez* and comparing it to the *Pueblo*. What did they say?

Sampson: I can't say that because I'm not sure there's anybody around how who was actively involved in the *Pueblo* incident. I know that the sharpening of the command and control system, and the Command Center as it now exists, was emphasized shortly after the *Pueblo* incident.

SB: Define sharpening.

Sampson: Sharpening in terms of organizing a Command Center for the sole purpose of coping with crises and crisis-related information, with a flag officer in charge – with that level of responsibility, and background and judgment represented.

SB: What's involved in team training?

Sampson: Well, we have a lot of team drills that we run. Imaginary crises. We'll take some team members and let them play a role of some outside agent or agency, and we'll actually write a script, and we'll set up a closed-circuit telephone system so that nobody gets the calls incoming or outgoing except ourselves, and we'll play a little miniature war game. We drill ourselves all the time. Just to try to keep ourselves sharp, and to help us anticipate a little bit better when a real crisis does occur, to improve these fast reaction cards that I mentioned and so forth.

SB: Well, back to *Mayaguez*. We're into Wednesday, the 14th.

Sampson: I think the last thing I gave you in the account was that a boat was spotted with possible Caucasians aboard, and so forth. Some boats had been sunk by this time. Now on the 14th, the decision was made as to what to do, and what type of military operation to run, and the operation was kicked off. This order was given after, as I'm sure I've already covered with you, extensive planning, positioning of forces, examination of options, and so forth. The decision, once it was made, was carried out, and I'd like you to underline, to the letter. There have been some press reports, from what sources I have not the slightest idea, that the forces didn't go where they were supposed to, they went to the wrong island, or some such damn thing. It's not true. The military operation went off precisely as it was planned, and precisely as it was directed. I've never been a Marine, but I was as proud of the Marines as if I'd spent 25 years in the Marine Corps.

SB: Why?

Sampson: Well, because in my judgment they performed magnificently. Now look what we're talking about. We're talking about mid-afternoon on the 14th of May. We didn't even get word of the thing until the morning of the 12th. That represents a total elapsed time of about 60 hours. During that time, we had to: verify the information; begin a cursory examination of options; move forces to central locations from which they could be used, from a wide range of bases all over the Pacific area; continually evaluate the situation; keep track of the ship; then, once the forces were gathered, get the decision to them with enough lead time so that they could be properly briefed and instructed on what they were to do. Well, I'd say this is a magnificent reaction time. And as I say, the Marines performed exactly as they were instructed to do. There were some surprises, as there always are in military operations; that's one of the things that makes our business interesting and exciting. One never knows what the other guy's going to do.

SB: What were the surprises?

Sampson: Probably the biggest single surprise was the exact location of the enemy force that was encountered on the island. And we had some losses, principally because of helicopters being shot down.

SB: To what do you attribute that surprise, poor reconnaissance?

Sampson: Poor reconnaissance? Not hardly. How do you perform reconnaissance on a jungle? We had all the reconnaissance assets that could be expected in that particular area. Given more time perhaps we could have come up with precise locations, but we – I should say, they – had to balance time against available information. When you start putting two combat forces together, people are going to get hurt.

SB: I guess what I'm trying to find out is, you can't see troops that are already in a jungle, but if they arrive while you're watching, you would see them.

Sampson: Yeah.

SB: So presumably the Cambodian forces were already on Koh Tang.

Sampson: Although intelligence had estimated the size of the enemy force accurately, their exact location was unkown.

SB: That must be why they took the ship there?

Sampson: Well, that would be a presumption. I have no idea why they took it there. In retrospect, one might say we were quite pleased that they took it there rather than into the port.

SB: This is interesting. If they already had troops there, at Koh Tang, that would signify some kind of prior intent on their part. There's no reason to have troops on a 3-mile island.

U.S. pararescueman returning fire from Koh Tang with a minigun in the rear of a Jolly Green Giant helicopter.

Sampson: Now, I would suspect that you're beginning to move into the area of speculation. I'm not going to get involved in that, because I really have no idea. One can only guess why they did what they did. OK, to get back to the narrative and complete the facts, I think it is common knowledge that one of our destroyers, part of the forces that had been previously dispatched to that area, the *Holt*, came along side the *Mayaguez* at about 8:45 PM. And within a relatively short time after that, the Marines were in full control of the ship. There was nobody found on board, but there was some food found on the dining room table, and a warm kettle on the stove, indicating a hasty departure on somebody's part.

SB: While this was going on, what if anything, were we getting from the Cambodians?

Sampson: Can you qualify that to "to your knowledge"? To my knowledge, nothing.

SB: Were we attempting to communicate directly with them? or through intermediaries?

Sampson: I can't say, because I wasn't involved in that. I do know that efforts were made, but precisely how I can't tell you.

SB: Ok, we're back in the middle of the action here, the Marines are on Koh Tang, and experiencing fire. They, as I gather it, were going to take the entire island and then in the course of doing that they were told that the crews had been recovered and they stopped and stayed on the beachhead. Is that correct?

Sampson: Well, let's put it this way, they attempted to disengage, and they did so as best they could because at that point our entire interest was preventing further casualties to U.S. personnel and getting them out safely, and the local commander did whatever he needed to do to accomplish that.

SB: I see — this is who? — he's got the full say so at this point.

Sampson: The senior Marine officer, the designated commander of the force, and I've forgotten who he was, frankly.

SB: What is the unit that went on Koh Tang?

Sampson: I don't have that information in front of me.

SB: I never saw that in the papers.

Sampson: They were from more than one unit. As I told you, it took us some time to get the force gathered at a point from which they could launch this type of an operation — which even adds to the professionalism of the Marines, the fact that on very short notice they could come up with that kind of cohesive, disciplined organization and make it work.

SB: Then you as another military guy think they did all right.

Sampson: I think they did a stupendous job, under very difficult circumstances. Terrain they'd never seen before, an air mobile operation, coming in by helicopter in unfamiliar territory, against an unknown force, suffering casualties and still getting on with it. Now, I think we ought to be proud of those folks.

SB: So let's see what we've got left. You had a helicopter problem. . . .

Sampson: Problem? Define that.

SB: As I understand it, something like 5 out of the 11 were non-functioning.

Sampson: Three were shot down and two more were disabled by enemy fire.

SB: And the question was whether to bring the Marines out in two 100-man hunks or wait till you got more choppers from the *Coral Sea*.

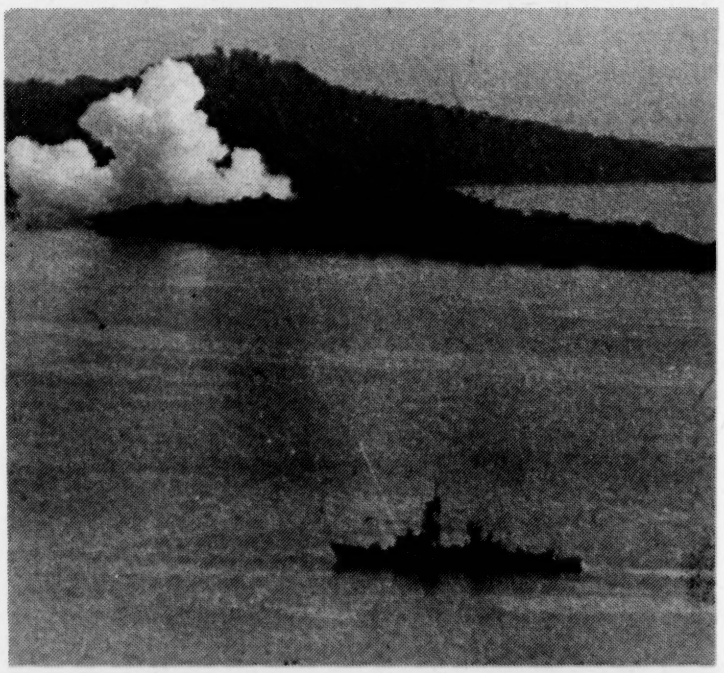
Sampson: Well, yes, you can imagine that kind of a decision. But that decision was made, that problem was solved in the Pacific Command.

SB: How good were communications? They must have been very good.

Sampson: Outstanding. We had continuous communications with all the people that we needed to talk to. Totally secure, by that I mean with coding devices so that we could talk about anything that we needed to.

SB: So, in the homestretch here, how did it proceed to conclusion for you guys?

Sampson: For the Command Center? Well, we all applauded when the crew was rescued. And another great shout went up, kind of like a space launch, when the Marines were extracted, and the operation had been successfully



Barrage from the Destroyer Wilson during the Koh Tang assault May 15. It was the Wilson that shortly recovered the Mayaguez crew, who were brought by a Cambodian gunboat flying a white flag.

completed. And sort of like a space launch, too, if you want a human interest side of this, to be corny about it – if you've seen pictures of the ground people who man all the consoles and the headsets during a space launch, they all have a feeling of involvement with it, and we sort of get the same feeling when this kind of a thing goes on.

SB: Sounds good. What kind of wind-down operation then, do you have?

Sampson: Oh, that's very simple. That's the simplest thing in the world. The decision makers, when it was over, simply packed up their brief cases and left, and we closed a couple of doors, and put some of the telephones away, and went back to business as usual. It takes less time than it takes to tell about it.

SB: What's the pace of business as usual, there?

Sampson: Oh, minutes of boredom and minutes of panic. If there is no crisis going on sometimes the time can drag. At times like that, we attempt to schedule training activities of one kind of another. And then, of course, when a crisis does occur, there's instant adrenalin. That I think can best describe the way it goes. There's lots of routine that we take care of. Routine checks, communication checks of one kind or another, routine message flow, various kinds of exercises to reassure ourselves on a continuing basis that the machinery works. A case like the *Mayaguez* tends to illustrate the fact that it does.

SB: Well, the *Mayaguez* is obviously a conspicuously unusual event, but how often do you find yourselves having some kind of emergency?

Sampson: Well, we've had some beauts in the last few months.

SB: Such as . . .

Sampson: Well, the extractions from Cambodia and Viet Nam are good cases in point.

SB: What were your functions in relation to those?

Sampson: Best described – as in the second phase of the *Mayaguez* – to support decision makers. The message flow and the message traffic picks up significantly during an operation of that type, so that one of our functions also becomes one of culling the vast amount of reports, messages, and information from various sources that flow in, skimming off the most important that require most immediate attention and bringing them to the attention of the decision makers on a timely basis. We keep track of events as they occur, and we provide briefings for senior people. And I can assure you that our senior people, when a crisis situation like this occurs, are very much involved. They don't sit home and smoke cigars and let somebody else do the work for them. They come around and are actively involved, and they assume their responsibilities and carry them out (in my opinion) in beautiful fashion, even though you didn't ask the question.

SB: Well, having seen this room you work in and finding it rather endearingly humble, I'll ask if the Command Center will be staying so humble indefinitely?

Sampson: There is a new center being constructed now. The physical space that we occupy was adapted from other spaces. It was never designed from scratch as a Command Center. But that is being rectified now.

SB: Can you say what some of its advantages will be over what you've got?

Sampson: Really, the single biggest advantage is the organization of space. There will be some increases in communications capability. The juxtaposition of folks, probably is the best answer, the way we've organized it for human beings to work in.

SB: So instead of a bunch of little rooms, you'll have something more like the Dr. Strangelove set?

Sampson: I don't remember the Dr. Strangelove set that well, but we will have an excellent visual display capability. I remember Strangelove, the guy in the chair, whose arm he couldn't control? You know, I've looked around the building for somebody like that, and I haven't found him yet.

SB: Let me track down through my sequence here, and see where I've raised questions of my own. The term piracy was used early on. That first came public with Ron Nessen talking public for the press. I wondered where that first entered the discussions.

Sampson: I have no idea, but isn't it obvious?

SB: Well, technically it's not correct.

Sampson: Oh?

SB: Piracy involves a private ship, not someone flying under a flag. Piracy would be, you know, if some guys in a junk were on their own, and took the ship and ran off with all the stuff.

Sampson: Hmm. Well, you're obviously ahead of me on the research department, I haven't researched all these fine points, but they are just that – fine points.

It's still merely a fine point, but since you brought it up I consulted Webster's Third New International Dictionary (Unabridged) and found the following: '1: robbery on the high seas 2a common law: an act of depredation with the intent of stealing committed on the high seas that would if committed on the land amount to a felony. . . .' Let's not quibble on the word. We all know that the crews of Cambodian gunboats fired at, boarded, and appropriated an unarmed merchant vessel. *[more →]*

Downed U.S. helicopters on the Koh Tang beach.

Marines on the Mayaguez, presumably delighted at meeting no resistance to their boarding, do the flag number. Deck of the Holt visible behind them.

W.C. O'Neill

"Civilians? Aren't they those people that go around with nobody In Charge?"

Don at his Command Center desk. The posed smile is genuine. He's days away from the end of a hard year. Command Center duty is tedious, arduous, uncreative, heavily supervised, and responsibility-laden. What would you have done with that initial Mayaguez message – phone everybody immediately or try to check it out first? At 5:30 am.

SB: Our operation was finally fairly restrained and a surgical one.

Sampson: That's how it was planned.

SB: And I wondered what range of choices that was among, that that one was taken.

Sampson: I can't say. And even if I could, I wouldn't. And I hope you'll understand why. Have you ever been involved in a brain-storming session? A true brain-storming session, one that performs its function, is one in which people in a sealed room throw out ideas, no matter how far-fetched they might be, because sometimes even a far-fetched idea that's absurd on the face of it will trigger a mirror-image kind of response that turns out to be a good idea. And so to speculate, or even to go back and dissect any given idea or option that might have been tabled in a discussion like that is absurd. Because it could be totally blown out of context. So, as I say, even if I knew, I wouldn't say.

SB: Whenever something like this goes through, everybody learns a lot. What do you think was learned with *Mayaguez*? in terms of your operation?

Sampson: In terms of our operation? Oh, we might have found a little better way to improve our check-out procedures on a case like this.

SB: You mean verifying the informa*' on?

Sampson: Yeah, but just in a very minor way. It was mostly reassuring, because the system worked. And even if we were to attempt to apply some little lesson that we learned from this one, we know from experience that the next one that comes along will be so totally different that what we ought to be spending our time doing is just perfecting our standard type drills, so that we are capable of reacting quickly.

SB: Is there a sort of internal history of the Command Center?

Sampson: I think it might be dry and dull.

SB: Are you kidding? I think it would be fascinating.

Sampson: No, I think the only dramatic part would perhaps be the new emphasis on the requirement, to repeat my word, the sharpening of the requirement, following the *Pueblo* incident.

SB: Geez, if I were a military historian, I'd go after that one in a minute. It'd be a sensational book, I think.

Sampson: Are you serious?

SB: Yeah, absolutely, because it's got everything. It's got drama and crisis and all that stuff, it's got design of a facility evolving or co-evolving with world events, it's got famous characters passing through and doing famous things, . . .

Sampson: Isn't that funny. I never would have thought of that. It's like anything, if you're involved with it yourself it soon becomes sort of routine, and non-exciting.

SB: Your preference is to do something else?

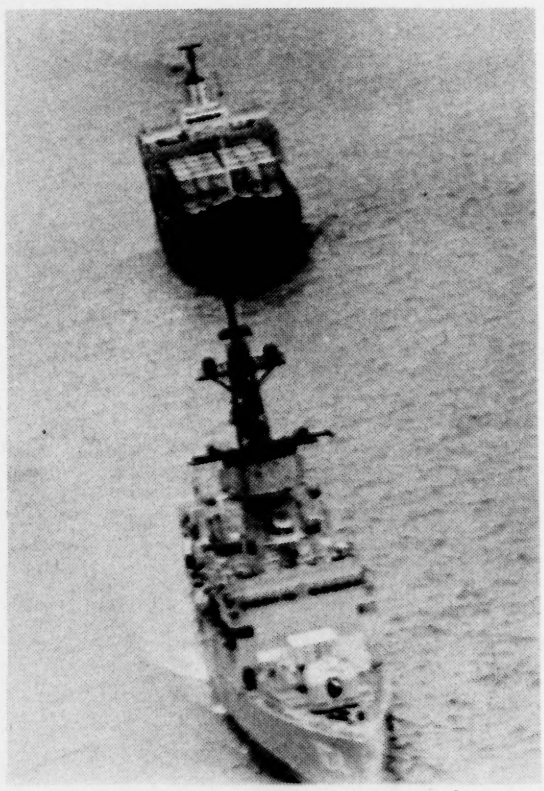
Sampson: Well, no that's an unfair question. Following this assignment, absolutely. But you see, that's the way I've been all my life. Most military people, one of the reasons they stay in the military, is because they're constantly given a different kind of challenge. It's the best thing about duty in the Army.

SB: How long do you have this assignment?

Sampson: One year.

SB: Is that routine for everyone that goes through?

Sampson: Only for the flag officers, the five generals and admirals. It's a year's tour. But we're not allowed to take a leave during that year, and there's a good reason for it. The thing must be continually manned. It takes just about five on a continuing basis to man it 24 hours a day around the clock, seven days a week. A year's tour is about enough. And for me personally, I'm leaving this to go back to my first love, which is troop duty with an infantry division. ■



The Mayaguez under tow by U.S.S. Holt from Cambodian waters.

Structural Stability and Morphogenesis

[It will be some time before the work of Rene Thom, like the work of Einstein or Newton, will come to be fully apprehended and integrated into the structure of scientific thought. Aware of this, the reviewers make no claims regarding the completeness of their comments. —Marc Le Brun]

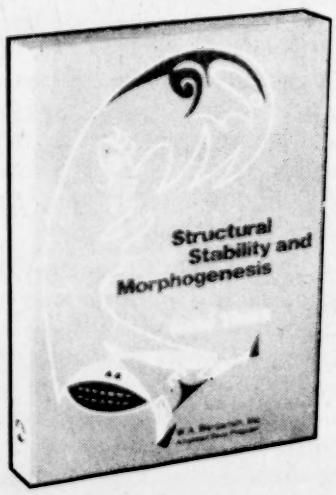
This is an incredible, poetic book. It has already started a cascade of new work in biology, physics and neurophysiology, and it is going to transform all of the sciences now grappling with phenomena too complex to be described in the old Newtonian language. It is a very difficult, knotty, book, a weaving together of asthetic vision, personal insight, and very tough math.

Thom has made a fundamental connection between the mathematics of form (differential topology) and forms as they appear in science and human experience. His conjectures are proving out experimentally — the language of forms he provides can guide the researcher and the designer.

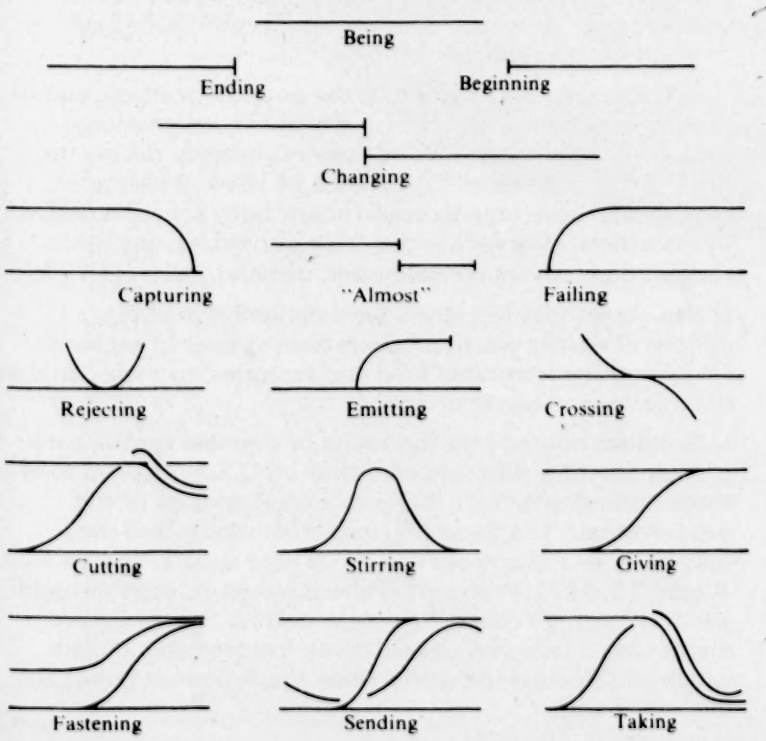
Further, his language describes the dynamic of form: birth, differentiation, predation, fertilization, parturition, death. Pirgogine and others are linking Thom's Catastrophe Theory up to the thermodynamics of open systems and the theory of self-organizing systems. The door is opened; at last we have a language which respects the diversity, subtlety and complexity of organic form, while providing a bridge to the tools and knowledge of classical quantitative science.

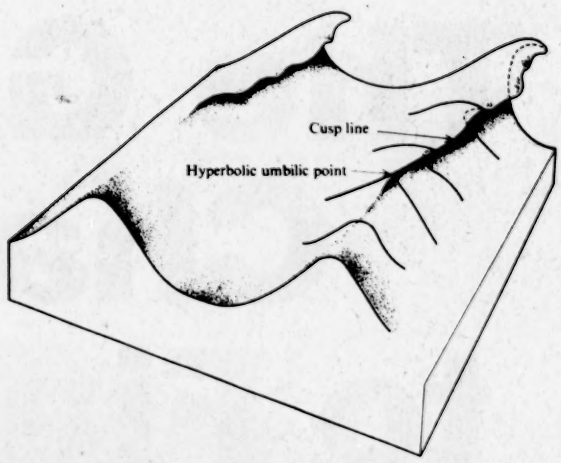
—Jed Harris and John Nash
[suggested by Paul Ryan]

Structural Stability and Morphogenesis
(An Outline of a General Theory of Models)
Rene Thom
1975; 348pp.
$13.50 postpaid
from:
Addison-Wesley Pub. Co., Inc.
Pub. Co., Inc.
Reading, MA 01867
or Whole Earth



The table of archetypal morphologies.





Finally, the choice of what is considered scientifically interesting is certainly to a large extent arbitrary. Physics today uses enormous machines to investigate situations that exist for less than 10^{-23} second, and we surely are entitled to employ all possible techniques to classify all experimentally observable phenomena. But we can at least ask one question: many phenomena of common experience, in themselves trivial (often to the point that they escape attention altogether!) — for example, the cracks in an old wall, the shape of a cloud, the path of a falling leaf, or the froth on a pint of beer — are very difficult to formalize, but is it not possible that a mathematical theory launched for such homely phenomena might, in the end, be more profitable for science?

The pre-Socratic flavor of the qualitative dynamics considered here will be quite obvious. If I have quoted the aphorisms of Heraclitus at the beginnings of some chapters the reason is that nothing else could be better adapted to this type of study. In fact, all the basic intuitive ideas of morphogenesis can be found in Heraclitus: all that I have done is to place these in a geometric and dynamic framework that will make them some day accessible to quantitative analysis. The "solemn, unadorned words," like those of the sibyl that have sounded without faltering throughout the centuries, deserve this distant echo.

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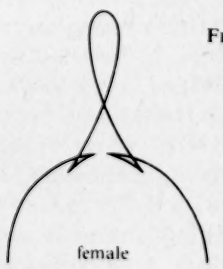


FIGURE 9.23

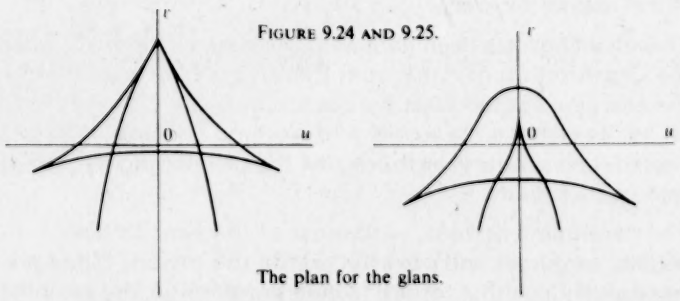


FIGURE 9.24 AND 9.25.

The plan for the glans.

The analogy of Figure 9.24 with 9.23f can be explained if we view copulation as a reversible capture.

•

It is an enormous step from noticing the presence of isomorphic morphological accidents on different substrates, to establishing some fundamental coupling between these substrates to explain these analogies, and it is precisely this step that delirious thinking takes If some of my arguments, particularly in biology, have seemed to the reader to lie on the boundaries of delirium he might, by rereading, convince himself that I have, I hope, at no point made this step.

The Gathering Challenge to Fiat Money

BY CARTER HENDERSON

The freedom of wealthy nations to exchange their intrinsically worthless, endlessly inflatable fiat currencies for valuable goods and services is finally being challenged by their suppliers, led by the resource-rich countries of the Third World. The result could be that greater fiscal and monetary responsibility will be forced on the industrialized West, or that the Third World will issue its own international trading currency backed by its own raw materials.

Over the past two years, an historic confrontation has been taking place between the wealthy, but resource-supplicant countries of the industrialized West, and the poor, but resource-rich countries of the Third World.

At issue is the advanced countries' use of the printing press to create dollars, pounds and other intrinsically worthless fiat currencies which are then exchanged for the developing countries' valuable and frequently irreplaceable raw materials.

Since the turn of the century, the Grand Alliance between Western governments and their captive banking systems has become a runaway engine of inflation turning out massive amounts of non-productive, debt-backed money to finance wars, and create jobs for industrialized populations now dependent on their leaders to find them work to do. This, in turn, has necessitated the continual expansion of demand for more and more material goods using fiscal and monetary tools legitimated by Keynes. The result of all this has been a debauching of Western fiat money left suddenly vulnerable to challenge from powerful Third World newcomers to the global economic arena.

This challenge has been gathering strength since 1973 when the Organization of Petroleum Exporting Countries staggered the energy-addicted West by quadrupling the price of their oil, while alerting the world – as nothing else could – to the wealth-redistributing authority of the developing nations' resource weapon.

The developing nations, with most of the world's land, people, resources and poverty, are on the march. They are aggressively pushing for an "active program on the establishment of a new international economic order," and have pledged themselves to raise their share of world consumption from 7 per cent to 25 per cent by the end of this century.

Carter Henderson is a writer and consultant on financial, economic and international affairs. He co-directs the Princeton Center for Alternative Futures. This article is slightly condensed from his paper given at the World Future Society General Assembly, Washington DC, June 4, 1975.

–SB

Third World nations hope to achieve these goals, in part, by forming OPEC-style raw material cartels (recently sanctioned by the United Nations which they now control), by getting developed countries to pay more for their raw materials and agree to help stabilize prices at these higher levels, and by recapturing control from foreign corporations over the rate at which their depletable resources will be extracted and shipped abroad.

Since the Age of Elizabeth I, the British pound sterling, and more recently the American dollar have ruled the world as planetary currencies eagerly accepted in exchange for whatever their owners wished to buy. One reason was that for years these currencies could actually be exchanged for silver and gold. Another reason was that the hard-working British and Americans were champion exporters whose manufactured goods and investment capital were sought after throughout the world, and whose needs for foreign goods and raw materials were successfully controlled to produce favorable trade balances and a continuing high demand for their currencies.

World War I marked the end of the pound's primacy, and its replacement by the U.S. dollar, which the International Monetary Fund made a world reserve currency during the historic Bretton Woods Conference in 1944. This meant that foreign governments could count both gold and dollars in the official reserves backing their currencies, and could redeem their dollars for gold upon demand.

It also meant that foreigners were delighted to accept billions of dollars worth of Uncle Sam's paper in exchange for everything from their land and factories, to their heritages of antiques and works of art.

U.S. dollars poured into the vaults of overseas central banks in such quantity that foreign claims on U.S. gold were soon three times greater than America's total reserves of the yellow metal. The Federal government recognized the possibility of a disastrous run on its gold supply, and on August 15, 1971, President Richard Nixon "closed the gold window" at the Federal Reserve engulfing foreign governments with a tidal wave of suddenly irredeemable dollars which had flooded the world when the American dollar was as good as gold.

[more →]

Cutting the dollar's anchor to gold eliminated the last slender safeguard against the endless degradation of the world's preeminent currency. This marked the end of U.S. leadership in world monetary affairs as foreign countries began unhinging their currencies from the dollar. Major trading currencies were soon adrift; free to float in international money markets where their value would henceforth be determined by foreign currency traders operating under the ancient law of supply and demand.

Now, for the first time in this century, the world monetary system was leaderless; reliant on patchwork arrangements between Western banks of issue to bring even a semblance of planned rationality to the ebb and flow of international currency movements.

If the United States and the other major industrialized countries had been content to live within the formidable productive capacities of their economies, their currencies would have become scarce hence strong. But the West had become committed to economic growth at any cost in order to keep their expanding populations fully employed and contentedly prosperous.

While the "cost" took many forms, from environmental pollution to the encouragement of force-fed consumption based on debt (in the U.S. alone debt rose from $400 billion in 1946 to more than $3 trillion in 1974), the biggest cost by far was the printing press degradation of the currency made visible by galloping inflation and the declining value of Western currencies on foreign exchange markets.

Now that the oil producing nations have shown the Third World how to play catch-up ball with depreciating fiat currencies, the question becomes how to offset future decreases in the purchasing power of Western currencies being savaged by galloping inflation. This will require a leap of imagination equal to the momentous decision to quadruple the world price of petroleum which unilaterally, and for at least the next decade, will peacefully transfer more than $100 billion a year from the affluent West to 13 developing countries in the Middle East, Latin America, Africa and Asia.

Within the next 25 years, the massive redistribution of resources from West to East will undoubtedly give rise to a Third World financial and commodity-trading center challenging New York, London, or Chicago.

Billions in petrodollars are rapidly making second-tier world money centers out of Kuwait City, Manama (Bahrain) and Teheran, among others, and these Eastern capitals are destined to grow in power as their oil and investment income, indigenous financial knowhow and infrastructure (from accounting services to electronic communications) increase in size and sophistication.

According to World Bank estimates circa Spring, 1975, the four sparsely-populated countries of Saudi Arabia, Kuwait, Qatar, and the United Arab Emirates will hold $333 billion of the $460 billion all OPEC nations are expected to have accumulated by the end of this decade. This compares with the entire world's current reserves of gold and foreign exchange of roughly $225 billion.

There seems little to prevent London, for example, from actually being eclipsed as a world commodity-trading center, and perhaps later as a financial center (this could happen rather precipitately if Britain's inflation continues to exceed 20 per cent a year). For decades, London has been the major world market for buying and selling Sterling Area raw materials including rubber, coca, tin, jute, tea, pepper and shellac. All it would take to shift this lucrative business to a Third World city such as Jakarta, Kuala Lumpur, or Beirut is money, communications, and a few dozen aggressive entrepreneurs skilled in commodity trading and preferred by commodity sellers.

Inevitably the Third World nations are busily thinking through the next steps in their challenge to fiat currencies. While their efforts have so far been uncoordinated and inconclusive, the general outline of two over-arching strategies is becoming increasingly discernible.

The first has to do with replacing the dollar with a more stable standard of value. And the second involves the creation of completely new currencies based on resources.

Developing nations are seriously examining ways to retire the enfeebled American dollar as the unit to express the value of their commodities and currencies. Earlier this year, for example, President Ahmed Sekou of the African nation of Guinea said the price of its bauxite would "no longer be pegged to the price of the dollar," but rather to the price of finished aluminum ingots.

The Sovereigns and Heads of State of the leading oil exporting nations, at their March meeting in Algiers, declared that "the price of petroleum must be maintained by linking it to certain criteria, including the price of manufactured goods, the rate of inflation, the terms of transfer goods and technology for the development of OPEC Member Countries."

The most serious blow to the dollar would be if countries began refusing to accept them in payment for their resources. This happened to the British pound in December, 1974, when Saudi Arabia informed the Arabian American Oil Company which markets its petroleum that it did not "desire" any further payments in pounds sterling — a rebuff that depressed the exchange value of Britain's inflation-ravaged currency to the lowest level in its long and distinguished history.

Up to now, the dollar has escaped sterling's fate. Foreigners seem willing to accept dollars provided they can be protected against the dollar's chronic instability. If the dollar is ever declared a currency non grata, however, it will most likely occur in one of the four under-populated countries mentioned earlier which cannot spend or invest their petrodollars as fast as they are being ruined by inflation.

When Britain's currency was worth a pound of sterling silver, and the U.S. dollar could be redeemed for gold, there was less need to look for a stable currency. In today's world of floating currencies anchored to nothing of value, mechanisms must be invented to measure how badly a currency's purchasing power is being eaten away by inflation.

The best invention yet discovered is indexing; the linking of weak fiat money to either something for which it will eventually be exchanged or to something of greater inherent stability such as Special Drawing Rights (SDR's) — also known as "paper gold" — which are an amalgam of 16 leading world currencies created by the International Monetary Fund for use in settling overdrafts between IMF countries.

As inflation robs fiat currencies of their purchasing power, it is the index that determines how much more of them sellers must demand in exchange for their wares.

The OPEC countries have chosen indexing to offset the declining exchange value of Western currencies. The 1973 quadrupling of the quantity of these currencies needed to buy a barrel of OPEC crude, for example, was an illustration of simple, brute force indexing by which years of inflation were wiped away by a single 400 per cent price increase indiscriminately imposed on all Western fiat currencies, from strong West German marks to flabby American dollars.

Iran, Saudi Arabia, Kuwait and Qatar, among others, have started denominating their currencies in SDR's rather than dollars; major European manufacturers and banks are floating loans expressed in SDR's; tolls on the newly reopened Suez Canal are quoted in SDR's; and the airlines

are considering setting international fares in this new IMF "money." The greatest expression of support for SDR's, however, came at the June meeting of OPEC nations in Libreville, Gabon. His Excellency El Hadj Omar Bongo, President of this West African Republic and a recent convert to Islam, welcomed the oil ministers with tribal drums and folk dances as Gabonese women cried "Long live Bongo, defender of our raw materials." The meeting's final communique announced that all OPEC countries will begin quoting the price of their crude oil in SDR's as of October 1 (when the current price freeze ends and the cost per barrel will almost certainly be raised again because of "increasing inflation, the depreciation of the value of the dollar and the consequent erosion of the real value of the oil revenues of member countries . . .").

The next logical step in this indexation scenario would seem to be an effort to link the amount of fiat currency a country must pay for its OPEC oil to some kind of OPEC Cost-of-Living escalator. The Shah of Iran has discussed this on numerous occasions in terms of the price his country must pay for industrial goods and commodities (primarily food) imported from the West. "If the world prices go down, we will go down with oil prices," the Shah said during a trip to Australia last year, "but if they go up, why should we pay the bill?"

It will be considerably more difficult for the OPEC countries to link the price of their oil to this kind of international consumables index which does not exist today, although the United Nations and others are working on the problem which now appears capable of solution because of recent advances in statistical, computer and communications systems.

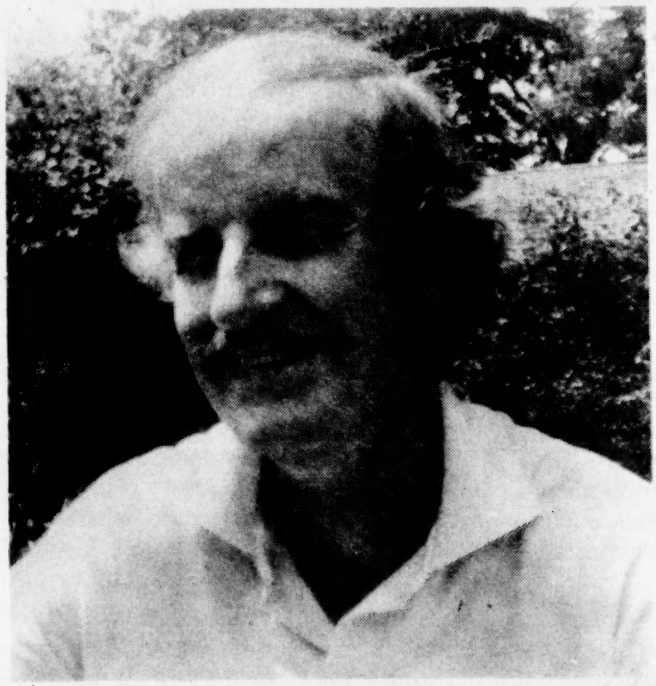
One developing country, Guyana, has disclosed its interest in going beyond a consumables index and actually establishing a new currency based on its chief resource – bauxite. L.E.S. Burnham, Prime Minister of this South American country, advanced this idea on November 4, 1974, at a meeting of the International Bauxite Association held in Georgetown, his nation's capital.

Prime Minister Burnham proposed that the new money be called the "IBA" in honor of the Association, and that all future bauxite sales be expressed in IBAs so that "the price and value of bauxite to bauxite producers would not be affected by the devaluation of national currencies in which so far bauxite sales have been denominated. "Thus," the Prime Minister noted, "if a transaction were made at 10 IBAs and the German mark or the dollar were devalued, the deal would still be at 10 IBAs. It wouldn't change for us."

It seems certain that the developing countries, either collectively, or initially in commodity-related groups such as OPEC or IBA, will insist that the value of their raw materials and currencies be measured by a more reliable yardstick than the dollar, or any other fiat currency linked to the dollar.

Developing such a yardstick, which has proven elusive up to now, would entail the creation of an index of manufacturers, currencies, (or most likely) commodities which represent the developing countries' greatest source of economic strength, are widely consumed and actively traded throughout the world, and are certain to increase in importance as a soaring world population competes for the raw materials needed to sustain life.

Such a commodity index could be composed of a "market basket" of 30 widely-used raw materials which have been carefully selected for their overall price stability, are continually bought and sold on world commodity exchanges, and whose indexed price – thanks to instantaneous global communications networks linked to computers – could be calculated almost from one minute to the next.



Hazel Henderson

Carter Henderson

The existence of such a commodity-based index raises some interesting possibilities.

First of all, it would tend to enhance the importance of Third World commodities at the expense of Western paper money.

Second, it would enable commodity suppliers to be compensated for declining fiat currency values each time a sale is made, instead of only once or twice a year when catch-up price increases are put into effect as is the case today.

Third, it would forcibly remind the industrialized nations that the purchasing power of their money was wasting away, and could conceivably encourage them to practice greater fiscal and monetary responsibility which would benefit their own citizens, as well as world trade.

Finally, and most importantly, the existence of a commodity-based index would pave the way for the creation of the Third World's own international trading currency backed by its own raw materials.

National currencies accepted as world money are usually issued by countries which dominate international trade. No single Third World country has this kind of far-reaching economic power, but as a group they do.

Countries belonging to the International Bauxite Association, for example, could create the IBA which would never become a global trading currency, yet would have to be taken seriously because aluminum is consumed throughout the world. The IBA could end up being quoted on foreign exchange markets in terms of the fluctuating value of other currencies, and if it were redeemable for bauxite its value would also reflect the changing market price for aluminum ore, as well as its worth as an investment in a key world commodity.

The Organization of Petroleum Exporting Countries could create a world currency rivaling the dollar itself, and if it was backed by, and redeemable for oil – black gold – it could even replace the dollar as the world's most widely used trading currency. This assumes the continued cohesiveness of OPEC countries, as well as their willingness to create a new form of money superior to their own national currencies (the exchange rate between the two on foreign

exchange markets would probably be quite close as long as the nation lived within its means, i.e., its oil income).

Should this scenario come to pass, the "OPEC" could become the new world monetary standard by which the value of all other currencies would be measured including the United States dollar.* Each country's ability to balance its trade with other nations would determine the worth of its currency expressed in "OPEC's," and artificial indices of value could be done away with, replaced by the pure pricing mechanism of supply and demand for world currencies on foreign exchange markets.

The ultimate trading currency, in my judgement, would be one issued by the United Nations and redeemable for commodities produced by member states who wished to monetize their raw materials in this way. The redemption value of "UNs" would be determined by computing the current market price of the resources originally pledged as backing for each issue of the new currency divided by the number of "UNs" comprising that issue.

Member states could pay their annual contributions to the United Nations by pledging their resources, and the U.N. in turn could pay its bills with its own money backed by them. Developing countries would gain from the new currency because it would permit them to convert their resources directly into honest money if the fiat currency price being offered on commercial markets was less attractive.

Some smaller countries might even wish to adopt the "UN" as their own national currency thereby further strengthening their trading posture (as Panama has adopted the American dollar).

The point is that we have entered a new era of monetary experimentation made possible by the emerging power of the Third World. An era for which there is little precedent, and few guidelines.

In the immediate future, we can expect monetary confusion as new and untried mediums of exchange vie to replace fiat currencies in what is still a free enterprise marketplace.

New national currencies, new currencies issued by commodity cartels including OPEC and IBA, new currencies offered by international organizations such as the U.N. or European Common Market, even new forms of "lifeboat" money printed by back-to-the-land communards who believe industrial society is collapsing and whose alternative, decentralist currencies could be made redeemable for the necessities of life they offer (food, clothing and shelter).

Private corporations, which recently began minting coins for foreign governments, may decide to produce and sell their own brands of stable, inflation-resistant currency. Something like this was actually done in Exeter, New Hampshire, in 1972 and 1973 when a non-profit group headed by Dr. Ralph Borsodi, issued an experimental currency called "constants" which were acquired for dollars by local townspeople who used them for everything from buying groceries to paying parking tickets, and whose redemption value was directly linked to the Cost-of-Living Index.

The price of "constants" was posted daily in the London office of The First National Bank of Boston along with dollars, pounds, marks and other foreign currencies; and had the experiment continued it was planned to make the "constant" redeemable for a group of 30 commodities such as gold, petroleum, peanuts and cotton.

While these efforts to retire fiat currencies are being advanced, Western finance ministers will continue to foregather at international monetary conferences called to devise fresh nostrums for the chronic balance-of-payments deficits which are destroying their paper currencies. Innovative versions of swaps, Roosa bonds, increased IMF quotas, SDRs and the other old palliatives will be lashed together yet again and heralded as the new guarantors of expanding world trade without ever coming to grips with the core problem — the failure of fiat money.

It is conceivable to me that the Third World, possibly led by OPEC, may soon decide to invite the resource-dependent Western nations to a world monetary conference in Jidda, Caracas, Lagos — as opposed to London, Genoa, or Bretton Woods — to hammer out new agreements.

Such a conference would also be of supreme importance to Western corporation executives, trade unionists, consumer activists, people living on fixed incomes and other politically-powerful groups within the industrial world itself who share the Third World's desire to protect their hard-earned money against the ravages of fiat currency inflation.

This, of course, could touch off the greatest upheaval in the history of monetary affairs — the politicization of money. A situation might arise, for example, where AFL-CIO President George Meany, black activist Jessie Jackson, or consumer advocate Ralph Nader would end up having as powerful a voice in determining the future of U.S. monetary policy as Chase Manhattan Chairman David Rockefeller, Council of Economic Advisers Chairman Alan Greenspan, or Federal Reserve System Chairman Arthur Burns. Citizen activist groups have been pressing for the addition of labor, consumer and environmentally-oriented economists to the President's Council of Economic Advisers. And just a few weeks ago, John E. Sheehan, upon his retirement from the Federal Reserve's Board of Governors, suggested that this powerful monetary body "should be more representative of the various elements of society, including labor."

Once money has moved into the political arena, it will inevitably unloose the furies lying just below the surface of what Kenneth Boulding has called our "grants" economy. The U.S. political system will at last be confronted with the reality that John Stuart Mill drew attention to in 1848 in his **Principles of Political Economy**: the essentially political nature of all economic distribution. Daniel Bell calls this new conflict the "revolution of rising entitlements"; the transfer of wealth from those who have it to the multitude of interest groups demanding it for everything from extended unemployment benefits, mass transit and wildlife preservation, to pollution control, capital formation and low-cost housing.

Many of these demands, however, are engendered by the social and environmental disruptions caused by our economy's concentration on resource-intensive growth in private consumption. Such resource-intensive industries as autos, appliances, and real estate investment trusts are demanding more capital, more Keynesian remedies, more credit, and even bailout by the taxpayers to sustain their corporate existence. Their needs have long gone unquestioned. But as money itself is disciplined by international pressures and subsequently politicized, then our wasteful consumer industries will face their most serious challenge as the new needs for public goods and services become more strident. Americans, long accustomed to the cornucopia, are even now being confronted with the need to choose. ■

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* How about the "Barrel"?
—SB

*The "Barrel" is certainly an acceptable substitute for "OPEC" considering the diversity of objects that have been used to describe money — or as money itself including cattle, feathers, salt, tobacco, shells, tools, slaves, playing cards (which at times formed the chief currency of Canada), Hershey bars, nylons, cigarettes, human skulls (Borneo), and other things of value including warm beer which was used in part payment of wages in certain English coal mines in the middle of the last century.
—Carter

WRITTEN LETTERS

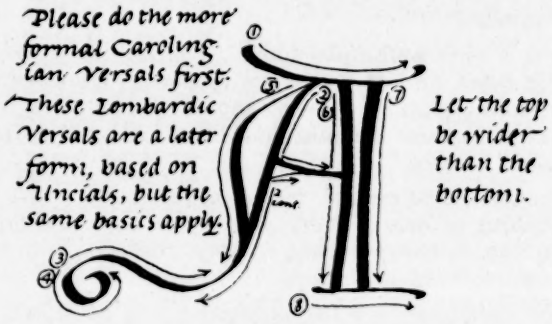
Here is a calligraphy book that communicates a real warmth and joy about making letters. Jackie Svaren has created 22 handsome alphabet worksheets, each surrounded with exquisitely tiny italic notes and comments and stories. The book is large (feels like a portfolio) and laid out beautifully in black and red with lots of marvelous empty space. The writing has had no reductions and no white paint touch-ups. How wonderful to discover ~~an author~~ a calligrapher who admits (and loves) her mistakes.

"Notice that a letter was left out of one word. The correction was put in above. REJOICE IN HUMANESS! Machines can't make mistakes. If you compete with a machine on its terms, YOU LOSE! so don't reduce your writing to being like type. YOU ARE NOT A TYPEWRITER. Admit mistakes, correct them & go right on."

This book transmits a feeling of ease and calm around a core of calligraphic discipline. It's a fine space to write from.

BARBARA BASH

Written Letters
Jacqueline Svaren
1975; 54pp.
$9.45 postpaid
from:
The Bond Wheelwright Co.
Porter's Landing, X.
Freeport, ME 04032
or Whole Earth

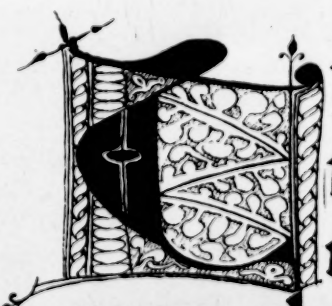

Please do the more formal Carolingian Versals first. These Lombardic Versals are a later form, based on Uncials, but the same basics apply.
Let the top be wider than the bottom.
2 point

The decoration here was done with a pointed crowquill. Tiny fine spotting brushes are good to use. For color I use an opaque tempra, but the possibilities for color are greatly varied.

Egg tempra was much used in the middle ages.

The scribe in the scriptorium was seldom the rubricator (who added the red) or the illuminator (who added the gold) or the miniaturist (who painted the tiny "illustrations"). Usually the main text was written out by the scribe. He would leave empty spaces - with sometimes a tiny indication of what was to fill in the space so the other artists would know what to put there.

To learn to lay gold is another very special art. The Guild of Scribes & Illuminators is the most elite guild in the world. Ruth Josslin is becoming our West Coast expert, & I am indebted to her for her help in illuminating. 21



The passage of time tends to make art form more elaborate. So, by the fifteenth century a considerable change had taken place in the versal letters.

Of course the important books done for rich clients (such as the Duke Du Berry) were much more elaborate than simple school texts.

Sometimes a book would not be completed - perhaps a client died - or was dissatisfied with the project. At any rate, the decorations were done AFTER the Calligraphy. This is still a good practice.

Notice the ligatures. There are many more than I can show here. It is permissable to invent your own, as long as they are convincing.

The small area above was written with a Mitchell #7.

Draw the outlines of your versal with the same pen you have used for the text. You may draw the outline with the same color you use to fill in the heavier areas. I don't care for black outlines.

More on "constants"

The organization which did the Exeter experiment with "constants" is

International Independence Institute
Box 183, West Road
Ashby, Massachusetts 01431

Donna Rasnake from Washington DC comments:

They issued a commodity-based currency which was convertible into U.S. dollars and could be deposited and cleared through checking accounts in ordinary banks.

The purpose of the experiment was to see whether the bank-clearing system they developed would work, and whether people in a small community would be willing to use the currency.

The clearing system did work, and the currency was successfully used by many merchants and their customers in the small town of Exeter.

Bob Swann of I.I.I. is in contact with OPEC about an alternative currency as discussed in Carter Henderson's paper. OPEC is actively interested but I understand that things are in the talk stage only.

Meanwhile I.I.I. is pursuing research on the technical problems involved with the development of alternative currencies, especially international ones.

Learning

Show Me!

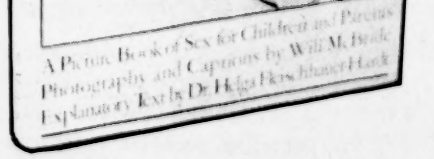
At the Wisconsin 'Y' Camp I went to in the '50s, we 12-year-old boys knowledgeably informed one another that when girls got excited their tits got hard. I simply can't imagine the difference this book would have made on our boundless curiosity and near-total ignorance about sex. (Might've saved me a few years of unwelcome virginity.)

It is a very well-made book. The text is as intelligent as it is brief, and concepts are presented quite whole – including graphic acknowledgement that kids too young and grown-ups too old may be disgusted by "all those naked people."

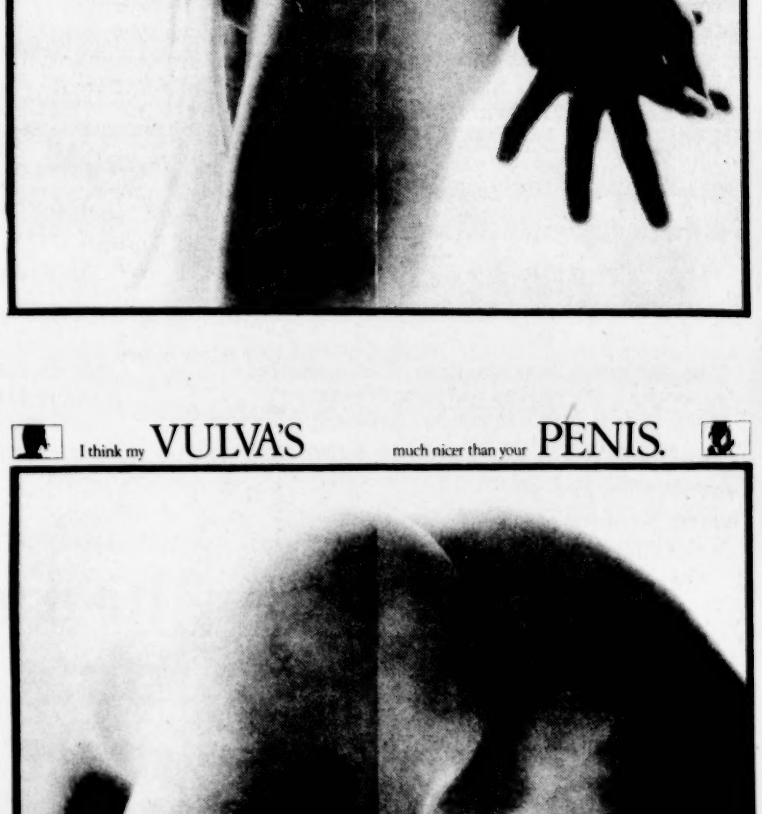
The point, of course, is the photographs – big beautiful pictures of nearly everything – children and adults petting, nursing, peeing, kissing, fucking, giving birth, studying each other's each-perfect bodies.

The hardcover is a bit expensive, and pederasts will have taken every library copy. Hold out for the paper.

–SB


Show Me!
A Picture Book of Sex for Children and Parents
Photography and Captions by Will McBride
Explanatory Text by Dr. Helga Fleischauer-Hardt

Show Me!
(A Picture Book of Sex for Children and Parents)
Will McBride, photography & captions
Helga Fleischauer-Hardt, explanatory text
1975; 176pp.
$12.95 postpaid
from:
St. Martin's Press, Inc.
175 Fifth Ave.
New York, NY 10010
or Whole Earth



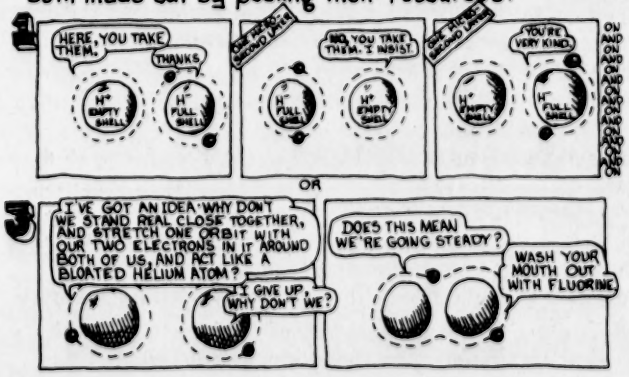
The Gunter Papers

Pretty damned charming kid-science – both for learning and for learning to learn. Learning is not facts Learning is story.

–SB

The Gunter Papers
Jack Gunter
1975; 191pp.
$3.95 postpaid
from:
Avon Books
250 W. 55th St.
Order Dept., 8th Flr.
New York, NY 10019
or Whole Earth

In the year 1923, most astronomers finally bought the idea that most of the stars traveled around in huge dangerous gangs which they called galaxies. These galaxies contained as many as one hundred billion stars each, and, oddly, they all seemed to be moving away from us at fantastic rates of speed. Did this mean that our galaxy had bad breath or some odious astronomical disease? Most astronomers didn't think so; they took this evidence as their first big clue to the unwritten history of the universe. Unfortunately, I can't reveal the secrets that they learned until I tell you about some fish with a serious case of the crazies.


If a Hydrogen atom found another Hydrogen atom in the same fix that he was in, they both made out by pooling their resources:
HERE, YOU TAKE THEM.
THANKS
BO, YOU TAKE THEM. I INSIST
YOU'RE VERY KIND.
OR
I'VE GOT AN IDEA. WHY DON'T WE STAND REAL CLOSE TOGETHER, AND STRETCH ONE ORBIT WITH OUR TWO ELECTRONS IN IT AROUND BOTH OF US, AND ACT LIKE A BLOATED HELIUM ATOM?
I GIVE UP, WHY DON'T WE?
DOES THIS MEAN WE'RE GOING STEADY?
WASH YOUR MOUTH OUT WITH FLUORINE.

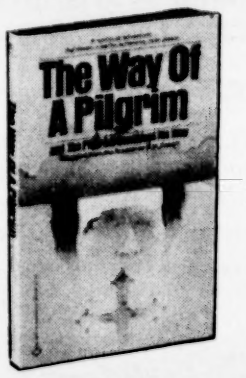
The Way of a Pilgrim

We do not know the Pilgrim's name. His world seems further removed from the world in which we live than most science fiction. The miracles he recounts seem less strange to us than the ordinary life of Russian villages and monasteries in the late 1850's, the setting of this autobiography. And yet seekers, whatever their path, will recognize both in the Pilgrim's travels and in his search the Way. All the elements are there: the guru (he calls him starets); the koan ("pray without ceasing"); the mantra (the Jesus Prayer, or Prayer of the Heart). Under the impact of Eastern Spirituality many Christians have rediscovered these realities in their own tradition. Salinger's **Franny and Zooey** *sent the first big wave of readers to* **The Way of a Pilgrim**. *The Pilgrim, in turn, advertises on every other page the* **Philokalia**. *(***Writings from the Philokalia on Prayer of the Heart**, *E. Kadloubovsky, translated by G.E. Palmer; 1951, 1962; $13.25, from Fernhill House Ltd., Humanities Press, Inc., Atlantic Highland, NJ 07716.) This is the book for anyone who seriously considers following this path. But the Prayer of the Heart is not for dabblers. I started on it before most* CQ *readers were born. And I still have a long way to go. But it draws you. It's a Path with Heart, as Don Juan would say.*

—Brother David Steindl-Rast
Mount Saviour Monastery

The Way of a Pilgrim
(and The Pilgrim Continues His Way)
Translated from the Russian by R. M. French
1974; 180pp.

$1.50 postpaid
from:
Ballantine Books, Inc.
457 Hahn Rd.
Westminster, MD 21157
or Whole Earth



We went into his cell and he began to speak as follows. "The continuous interior Prayer of Jesus is a constant uninterrupted calling upon the divine Name of Jesus with the lips, in the spirit, in the heart; while forming a mental picture of His constant presence, and imploring His grace, during every occupation, at all times, in all places, even during sleep. The appeal is couched in these terms, 'Lord Jesus Christ, have mercy on me.' One who accustoms himself to this appeal experiences as a result so deep a consolation and so great a need to offer the prayer always, that he can no longer live without it, and it will continue to voice itself within him of its own accord. Now do you understand what prayer without ceasing is?"

"Yes indeed, Father, and in God's name teach me how to gain the habit of it," I cried, filled with joy.

"Read this book," he said. "It is called **The Philokalia**, and it contains the full and detailed science of constant interior prayer, set forth by twenty-five holy Fathers. The book is marked by a lofty wisdom and is so profitable to use that it is considered the foremost and best manual of the contemplative spiritual life. As the revered Nicephorus said, 'It leads one to salvation without labour and sweat.' "

"Is it then more sublime and holy than the Bible?" I asked.

"No, it is not that. But it contains clear explanations of what the Bible holds in secret and which cannot be easily grasped by our short-sighted understanding. I will give you an illustration. The sun is the greatest, the most resplendent and the most wonderful of heavenly luminaries, but you cannot contemplate and examine it simply with unprotected eyes. You have to use a piece of artificial glass which is many millions of times smaller and darker than the sun. But through this little piece of glass you can examine the magnificent monarch of stars, delight in it, and endure its fiery rays. Holy Scripture also is a dazzling sun, and this book, **The Philokalia**, is the piece of glass which we use to enable us to contemplate the sun in its imperial splendour. Listen now, I am going to read you the sort of instruction it gives on unceasing interior prayer."

He opened the book, found the instruction by St. Simeon the New Theologian, and read: "Sit down alone and in silence. Lower your head, shut your eyes, breathe out gently and imagine yourself looking into your own heart. Carry your mind, *i.e.*, your thoughts, from your head to your heart. As you breathe out, say 'Lord Jesus Christ, have mercy on me.' Say it moving your lips gently, or simply say it in your mind. Try to put all other thoughts aside. Be calm, be patient, and repeat the process very frequently."

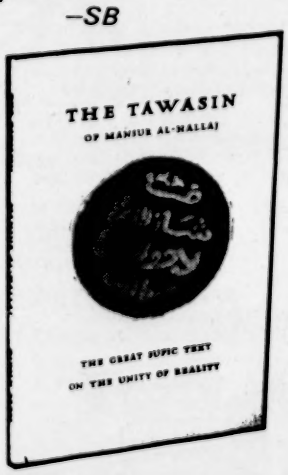
The Tawasin

Excellent spiritual diagrams and aphorisms from the Sufi revival. The logic of Love. This is the first book in what looks like an interesting series.

—SB

The Tawasin of Mansur Al-Hallaj
(The Great Sufic Text on the Unity of Reality)
Translated by Aisha Abd Ar-Rahman At-Tarjumana
1974; 81pp.

$3.95 postpaid
from:
Diwan Press
Fields Book Store
1419 Polk Street
San Francisco, CA 94109
or Whole Earth



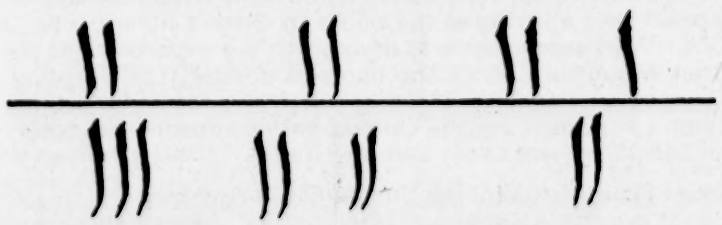
2. The moth flies about the flame until morning, then he returns to his fellows and tells them of his spiritual state with the most eloquent expressions. Then he mixes with the coquetry of the flame in his desire to reach perfect union.

3. The light of the flame is the knowledge of reality, its heat is the reality of reality, and Union with it is the Truth of the reality.

•

4. From Him comes the distance that separates others from His Unity. It can be represented thus:

5. The knowledge of Tawhid is an autonomous abstract cognizance, and is represented thus:



6. The Tawhid is an attribute of the created subject who pronounces it, and it is not an attribute of the Object professed as one.

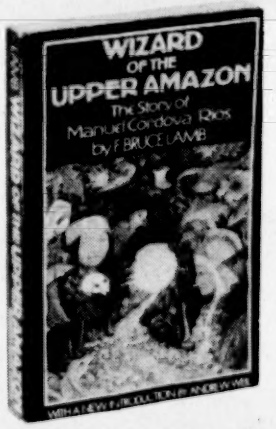
7. If I being created say 'I' did I make Him also say 'I'? My Tawhid comes from me then, not from Him. He is free (munazzah) of me and my Tawhid.

Wizard of the Upper Amazon: The Story of Manuel Córdova-Rios

Plunged into the middle of a jungle foodweb, only visions, plant narcotics, hunting skills and an incredible intimacy with the natural world sustain Córdova-Rios. In no other book have I felt the mixing of human and animal and dream worlds to be so clear and direct

I wrote the above paragraph in 1972 after reading the hardback. On re-reading the paper edition, I can only say that this book is far superior to anything Castenada has attempted. The Huni Kui is not a destroyed tribe like the Yaqui. The Huni Kui have pleasant and important communal visions much more astounding and connected-to-life than the individualistic "fearful" visions of Castenada. To complete the praise: This is one of the three of four best books I have encountered while reviewing for the Whole Earth.

—Peter Warshall



Wizard of the Upper Amazon
(The Story of Manuel Córdova-Rios)
F. Bruce Lamb
1971, 1974; 205pp.
$2.95 postpaid
from:
Houghton Mifflin Co.
Wayside Rd.
Burlington, MA 01803
or Whole Earth

Olson

Charles Olson was one of the four Grandfathers of modern American verse. Along with Pound, Williams, and Zukofsky (the only one left alive), he helped forge the revolution in our language and thought that whether we know it or not has taken over the universities and opened up English Departments all over this country to a particularly native way of looking at the world-reality and the role of the Poet. (It remains to be seen whether this revolution has already been co-opted or not.)

With **Olson** the experimentation continues after his death through the faithful publishing of his incidental papers and not so incidental poems. To my knowledge, it is one of the first times a poet's work has been made so readily available so soon after his departure from this sphere. Olson is shown to be a full figure, rounded with opinions, brilliance, mistakes and marvelous language. George Butterick edits in such a way that each issue presents a new view of Olson entangled in issues still current, still modern, and post-modern, a term intimately associated with the thought of the man.

The first issue contains a letter from Robt. Duncan about his last visit to Olson, a conversation with Herb Kenney, a poem, and a listing of the books in Olson's library (A-C). The second issue is devoted to the experience at Black Mountain College and contains a letter from Fielding Dawson, a letter from Olson, minutes of a faculty meeting, Olson's statement for the catalog, various poems and notes on education, and Olson's library (D-G).

Olson (The Journal of the Charles Olson Archives)

c/o George Butterick
Special Collections Department
University of Connecticut Library
Storrs, Conn. 06268

published twice yearly $10.00 a year, $3.50 for individual copies as available.

—George P. Mokray
Cambridge, Massachusetts

The jaguar circled with caution, and the anteater calmly turned in response. Finally in anger and frustration, the big cat plunged with a roar into the embrace, grabbing the anteater by the throat. At the same moment the two great forearms of the anteater, fitted with tremendous claws for pulling apart termite-infested logs, closed around the jaguar. As the exposed neck of the anteater was ripped with great teeth, the backbone and ribs of the jaguar were pulled apart by the powerful claws of the anteater. Both animals died almost instantly in each other's embrace.

•

The Huni Kui believed that the most powerful force coming from any live being was its breath and that words emanating from the breath were a creative force. Thus, with evocative chants and fragrant smoke from my smoking pipe filled with a mixture of tobacco and other herbs, I would create a trance-like atmosphere around the sick one. At the climax of the ceremony I would forcefully blow the fragrant smoke over the body of the patient. If symptoms of pain were present, I would by sleight-of-hand suck offending thorns from the painful areas and show them to the patient. Such intense psychological treatment with the patient in an hypnotic trance would initiate the desired cure. Herbal baths and potions taken internally would complete the treatment. By the same means, of course, it was possible for the chief to do away with undesirable elements in the tribe. In this state they could easily be poisoned or hexed.

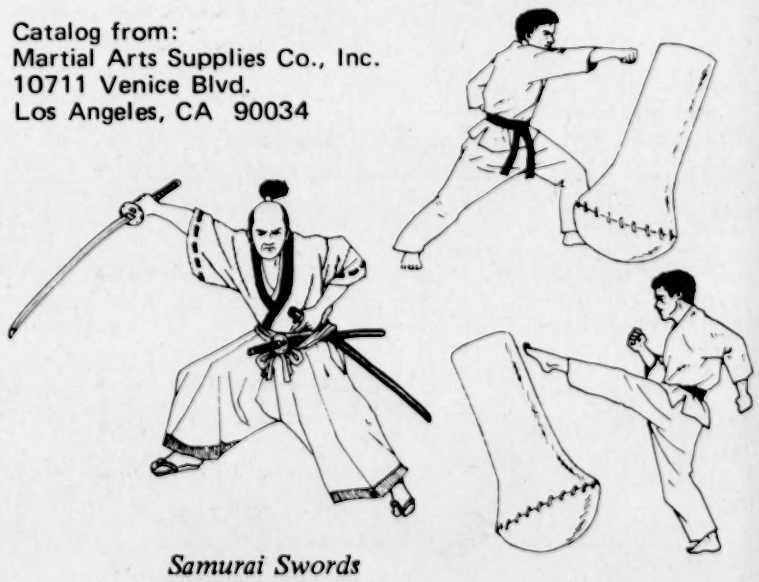
Martial Arts Supplies

Karate, Aikido, Kung-fu, judo uniforms, training aids, weapons, books, emblems.

Would the Vietnam War have been better if conducted strictly hand-to-hand? Why not do it that way next time?

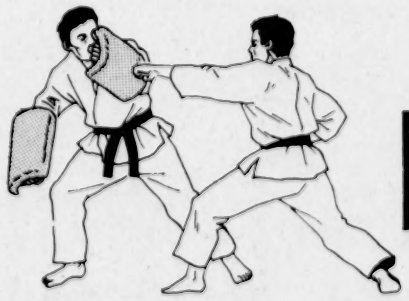
—SB
[Suggested by Carl Harp]

Catalog from:
Martial Arts Supplies Co., Inc.
10711 Venice Blvd.
Los Angeles, CA 90034

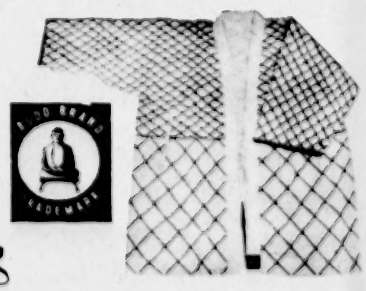


Samurai Swords (Daito and Shoto)
$119.95 & $89.95

Karate Training Dummy
$132.50



Striking Arm Pad $9.95



Kendo Keiko Gi $15.60

The (updated) Last Whole Earth Catalog

Changes

There is a brand new **16th Edition** *of the CATALOG, which the changes below will bring up to utter currency (Aug. '75).*

These changes plus the ones in the last 3 CQ*'s will bring a 13th, 14th, or 15th edition up to date. Hope someone's using this service. We're busting our balls on it.*

—SB

p. 6
The Atlas of The Universe
Out of Print

The Character of Physical Law
Change $2.45 to **$2.95**

p. 13
A Sand County Almanac
Change $0.95 to **$1.50**

p. 17
The Human Condition
Change $3.25 to **$3.95**

p. 22
Mankind 2000
Change $10.00 to **$14.00**

p. 26
The Second Genesis
Out of Print

p. 31
The Phenomenon of Man
Change $1.95 to **$2.50**

p. 32
Concepts of Ecology
Change $5.25 to **$6.25**

p. 33
Environment and Man
Change $7.50 to **$8.95**

p. 34
The Population Bomb
Change $ .95 to **$1.50**

Population, Resources, Environment
Change $9.95 to **$11.00**

p. 40
Earth Tool Kit
Out of Print

p. 43
Defending the Environment
Out of Print

p. 46
Farmers of Forty Centuries
Change $7.95 to **$8.95**

p. 51
How to Have a Green Thumb Without an Aching Back
Change $1.45 to **$1.95**

p. 53
Biodynamic Gardening — Gardening for Health and Nutrition
Change $1.25 to **$1.50**

Biodynamic Gardening — Pfeiffer Garden Book
Change $4.25 to **$3.30**

p. 63
ABC and XYZ of Bee Culture
Change $6.50 to **$8.50**

p. 69
How to Construct a Cheap Wind Machine for Pumping Water
Change $ .90 to **$1.25**
How to Build a Solar Water Heater
Change $ .90 to **$1.25**
Add **Production Drawing for Solar Cabinet Dryer $2.50**

p. 80
Stalking the Wild Asparagus
Change $2.95 to **$3.95**

Stalking the Blue-Eyed Scallop
Change $2.95 to **$3.95**

p. 80
Edible Wild Plants of Eastern North America
Change $10.95 to **$12.50**

p. 81
A Key to the American Psilocybin Mushroom
Out of Print

p. 86
Japanese Homes & Their Surroundings
Change $3.00 to **$3.50**

p. 97
Audel Guides — Masons and Builders Guide, Vols I, II
Change $5.95 to **$6.95**

Audel Guides Building Maintenance
Change $5.95 to **$6.75**

p. 105
Concrete Boatbuilding
Out of Print until 1976

p. 108
Plastics for Architects and Builders
Change $7.95 to **$12.50**

p. 118
Design Methods
Change $14.50 to **$18.50**

p. 132
Formulas, Methods, Tips and Data for Home and Workshop
Change $7.95 to **$10.95**

p. 133
Small Engine Service Manual
Change $5.95 to **$7.95**

p. 145
Gilliom Power Tool Kits
Change Kit $21.99 to **Kit $25.99 plus shipping**
Add **Brochure available for 25 cents to cover mailing costs**

p. 150
A Museum of Early American Tools
Add **$7.95 hardcover**

p. 160
A Potter's Book
Change $12.75 to **$15.00**

p. 171
The Complete Book of Progressive Knitting
Change $2.75 to **$3.45**

p. 173
N 34 Needlepoint
Change $7.95 to **$11.95**

p. 175
D7 Batik: The Art & Craft
Add **$5.80 postpaid from: Charles E. Tuttle Co., Inc. Rutland, VT 05701 or Whole Earth**

D9 Batik: Art and Craft
Add **$3.95 postpaid (1973) from: Van Nostrand Reinhold Co. Order Dept. 300 Pike St Cincinnati, OH 45202 or Whole Earth**

Business

p. 183
The Effective Executive
Change $5.95 to **$8.95**

p. 185
Atlas Shrugged
Change $1.75 to **$2.25**

p. 189
Salmon-Briggs-Way Company
Add **Shipping begins in September and continues as long as the supply lasts, then orders are taken for the next season. Smoked salmon caviar spread is available all year.**

How to Buy Food
Out of Print

p. 190
Fannie Farmer Cookbook
Change title to **All New Fannie Farmer Cookbook**
Change $1.50 to **$1.95**

p. 208
Koehler Method of Dog Training
Change $5.95 to **$7.95**

p. 209
The Goshawk
Out of Print

p. 212
The Stress of Life
Change $2.75 to **$2.95**

p. 214
The Merck Manual
Add **Sale restricted to physicians and their professional colleagues.**

p. 215
Dear Doctor Hippocrates
Out of Print

p. 217
American Indian Medicine
Out of Print

p. 226
How to Live on Nothing
Change $ .95 to **$1.50**

Champagne Living on a Beer Budget
Out of Print

p. 235
Justice Without Trial
Change $5.50 to **$5.95**

p. 237
Robert's Rules of Order
Change $ .95 to **$1.50**

p. 239
Hear the Sound of My Feet Walking Drown the Sound of My Voice Talking
Change $3.95 to **$4.95**

p. 242
Make It Defunct

p. 271
Cache Lake Country
Change $5.95 to **$8.95**

p. 275
Outdoor Survival Skills
Change $2.95 to **$4.95**

p. 290
Cruising Under Sail
Change $15.95 to **$22.50**

p. 305
Add to **"Traveler's Directory" $8.00, now offering a quarterly update and newsletter.**

p. 307
The Image
Change $1.95 to **$2.95**

p. 311
Technicians of the Sacred
Change $3.95 to **$4.95**

p. 313
Human Biocomputer
Change $4.95 to **$1.50**

p. 314
Eye and Brain — The Psychology of Seeing
Change $2.45 to **$2.95**

p. 315
A Model of the Brain
Change $9.50 to **$13.00**

p. 316
Design for a Brain
Change $3.95 to **$4.95**

Embodiments of Mind
Change $2.95 to **$8.95**

p. 319
World of Mathematics
Change $14.95 to **$19.95**

p. 336
The Sitar Book
Change $2.95 to **$3.95**

p. 350
Guide to Filmmaking
Change $1.50 to **$1.95**

p. 352
Total Picture Control
Change $12.50 to **$14.95**

p. 361
Short-Cut Shorthand
Change $3.95 to **$6.95**

p. 362
Bookmaking
Delete **Or Whole Earth Catalog**

Advertising Graphics
Change $7.50 to **$8.95**

p. 363
Printing With the Handpress
Out of Print

p. 371
Musical Instruments Made to be Played — Making and Playing Bamboo Pipes
Change $2.70 to **$1.75**

p. 373
Golden Handbooks — Weather
Change $1.50 to **$1.95**

Andrew Lang Fairy Books — The Violet Fairy Book
Change $3.50 to **$3.00**

p. 375
Peterson Field Guide Series — 14. A Field Guide to Rocky Mountain Wildflowers
Change $3.95 to **$5.95**

Peterson Field Guide Series — 15. A Field Guide to the Stars and Planets
Change $6.95 to **$4.95**

p. 382
Book of the Hopi
Change $3.25 to **$1.95**

p. 386
Kites
Change $1.50 to **$1.95**

p. 389
How to Build a Working Digital Computer
Change $4.75 to **$5.45**

p. 392
How to Salve It
Change $1.95 to **$2.95**

p. 393
Thinking Straighter
Change $4.75 to **$5.25**

p. 394
Teacher
Change $1.25 to **$1.50**

p. 400
Papier Mâché
Out of Print

p. 409
Sometimes a Great Notion
Change $1.25 to **$1.50**

p. 418
Developmental Psychology Today
Change $13.95 to **$14.95**

p. 419
In and Out the Garbage Pail
Change $1.65 to **$1.95**

p. 422
Self Hypnotism
Change $ .75 to **$1.25**

Psycho-Cybernetics
Change $ .95 to **$1.50**

p. 429
Galton's Walk
Out of Print

p. 431
Tantra Asana
Delete **or Whole Earth Catalog**

Whole Earth Epilog

Changes

These changes plus the ones in the Winter '74, Spring '75, and Summer '75 **CQ**'s *will make your EPILOG as new as good.*

—SB

p. 454
System and Structure
Change $23.75 to **$26.00**

Pigs for the Ancestors
Change $2.95 to **$3.95**

p. 456
A Treasury of Traditional Wisdom
Out of Print

p. 458
Passages About Earth
Add **$1.95 paperback**

p. 462
Perspectives in Ecological Theory
Add **$2.45 paperback**

p. 464
Agenda for Action 1974
Change $3.95 to **$5.95**

p. 466
Blueprint for Survival
Add **$1.25 paperback**

p. 467
Conservation Directory
Change $2.00 to **$3.00**

p. 475
Working With Nature
Change $15.00 to **$17.50**

p. 476
Mushrooms — The Mushroom Handbook
Change $3.95 to **$4.50**

p. 477
Spiders, Scorpions, Centipedes & Mites
Change $4.50 to **$5.00**

p. 478
Peterson Field Guides — A Field Guide to the Birds of Texas and Adjacent States
Change $5.95 to **$8.95**

p. 479
A Field Guide to Animal Tracks
Change $5.95 to **$4.95**

p. 480
Wildlife in America
Change $2.25 to **$2.95**

p. 482
Wildflower Guides by Colors — California Spring Wildflowers
Change $2.95 to **$3.95**

p. 490
Minerals and Man
Change $17.95 to **$20.00**

p. 495
Farmers of Forty Centuries
Change $7.95 to **$8.95**

p. 499
Horse Care & Horseshoeing — Lameness in Horses
Change $12.50 to **$22.50**

p. 510
Master Builders of the Animal World
Change $8.95 to **$10.00**

p. 511
The Nature of Design
Out of print until 1976

Design Drawing Experiences
Add **Design Drawing [a companion text]**
William Kirby Lockard
1974; 267pp.
$10.00 postpaid
from:
Pepper Publishing
2901 East Mabel St.
Tucson, AZ 85716
or Whole Earth

p. 512
The Poetics of Space
Change $2.95 to **$3.95**

The Barn
Change $25.00 to **$27.50**
Add **$9.95 paperback**

Dwelling
Change $5.50 to **$5.00**

p. 513
Illustrated Handbook of Vernacular Architecture
Change $8.95 to **$2.98**

Old-Time Ceiling Fan
Change $78 + UPS Freight to
$89 + UPS Freight
($78 each for two and $75 each for three)

p. 515
Plastering Skill and Practice
Change $9.95 to **$10.75**

p. 517
Pole Building Construction
Change $3.00 to **$4.50**

p. 521
Shaker Furniture Kits
Change Shaker Workshops, Inc., etc.
to **Shaker Workshops**
14 Bradford Street
Concord, MA 01742
or **Shaker Workshops West**
Main Street
Inverness, CA 94937

p. 523
Tipi Makers
Change "75 cents" to **$1.25**
Change "free" after "brochure is"
to **free, though a 10 cent stamp would be appreciated.**

p. 525
Frog Hand Woodworking Tools
Change address
to **Frog Tool Co.**
548 N. Wells St
Chicago, IL 60610
Add to Large Spokeshave
$7.00 postpaid
Change Small Router $5.40 pp
to **$8.69 postpaid**
Change Curved Blade Drawknife
to **Inshare, 8" curved cutting edge, wooden handles**
$9.55 postpaid

p. 528
Alternative Sources of Energy: Practical Technology and Philosophy for a Decentralized Society
Change $4.00 to **$6.95**

Producing Your Own Power
Add **Paperback $3.95 postpaid**

p. 534
Low Impact Technology Group
Change Low Impact Technology Ltd.
to **Conservation Tools & Technology Ltd.**
P.O. Box 134
Kingston Surrey KT2 6PR
England
Delete "Order publications from:" etc.

p.539
Earthworks
Change first sentence to:
"Earthworks — Foundations for Change — plans to publish a periodical New Earth Times in 'late 75'."

p. 540
The Science of Design
Change $5.95 to **$5.75**

p. 556
A Handbook on Beads
Change $5.20 to **$5.00**

p. 557
Stained Glass Primer
Change $3.25 to **$2.95**

p. 564
Earth Basketry
Change $2.50 to **$2.98**

p. 565
Indian Basketry and How to Make Indian and Other Baskets
Not **Out of Print**

p. 566
Creative Crochet
Change $10.75 to **$11.95**

A Treasury of Crochet Patterns
Change $12.50 to **$14.95**

p. 567
The Manly Art of Knitting
Change Threshold, etc.
to **Charles Scribner's Sons**
Vreeland Ave.
Totowa, NJ 07512
or Whole Earth

p. 568
Mountain People, Mountain Crafts
Change $2.95 to **$3.95**

p. 569
Step-by-Step Tablet Weaving
Change $2.50 to **$2.95**

p. 571
Embroidery — The Art of Crewel Embroidery
Change $3.95 to **$4.95**

Bargello: Florentine Canvas Work
Change **$6.95** to **$7.95**

p. 572
America's Quilts and Coverlets
Change $25.00 to **$7.98**

p. 573
Patchwork
Change $11.50 to **$18.50**

p. 577
The San Francisco and Bay Area Peoples' Yellow Pages
Change $1.75 to **$3.00**

p. 581
The Merck Veterinary Manual
Change $14.00 postpaid to **$13.25**
Add **Sale restricted to veterinarians and their professional associates**

p. 582
Rebirth of Feminism
Change $3.95 to **$4.50**

p. 586
Source Catalog No. 2
Change The Swallow Press, Inc., etc.
to **Source Collective**
P.O. Box 21066
Washington, D.C. 20009

p. 588
Diet for a Small Planet
Change $1.25 to **$1.95**

p. 589
The Food Conspiracy Cookbook
Change $3.95 to **$4.95**

p. 591
The Vegetarian Epicure
Change $3.95 to **$4.95**

p. 595
Home Winemaking Books — Step by Step Winemaking
Change $2.50 to **$2.95**

p. 604
The Well Body Book
Change $5.95 to **$6.95**

p. 607
Serve the People
Add **$4.45 paperback**

p. 610
Lovers, Friends, Slaves
Add **$1.75 paperback**

p. 614
Last Rights, A Case for the Good Death
Add **$1.50 paperback**

p. 616
While You're Up, Get Me a Grant — The Foundation Directory
Delete or Whole Earth

Where the Money Is & How to Get It
Change $10.45 to **$10.00**

p. 620
Kind & Usual Punishment
Change $1.95 to **$2.45**

p. 621
Indians in Overalls
Change $6.00 to **$10.00**
Coyote Man & Old Doctor Loon
Change $6.00 to **$10.00**
Don Bartolomeo
Change $6.00 to **$10.00**
Coyote's Bones
Change $7.00 to **$12.00**
The Lariat
Change $7.00 to **$12.00**
All five
Change $32.00 to **$54.00**
Change Turtle Island Foundation, etc.
to **Turtle Island Foundation**
2845 Buena Vista Way
Berkeley, CA 94708

p. 623
Basic Black Books — Selected Poems of Langston Hughes
Change $6.95 to **$8.95**

Basic Black Books — Stride Toward Freedom: The Montgomery Story
Change $ .95 to **$5.95**

p. 624
General Reference — American Negro Poetry
Change $4.95 to **$2.65**

p. 629
Health Care in China — Serve the People: Observations on medicine in the People's Republic of China
Add **$4.45 paperback**

p. 635
Explorers Ltd. Source Book
Change $4.95 to **$5.95**

p. 636
The People's Guide to Mexico
Change $3.95 to **$4.50**

p. 638
Anybody's Bike Book
Add **$3.95 postpaid from**
Ten Speed Press
P.O. Box 4310
Berkeley, CA 94704
or Whole Earth

p. 643
The Super Catalog of Car Parts & Accessories
Change $4.95 to **$5.95**

p. 643
Volkswagen Official Service Manual (Super Beetle, Beetle & Karmann Ghia 1970-74)
Change $9.95 to **$12.95**

p. 649
Basic Sailing
Change $2.50 to **$2.95**

p. 650
Self Steering
Change $5.00 to **$8.00**

Marine Engines and Boating Mechanics
Change $12.50 to **$11.95**

p. 658
Outdoorsman's Handbook
Change $5.95 to **$6.95**

Packrat Papers
No. 1 Out of Print
Add No. 2 at $1.50

p. 663
XC Cross Country Skiing
Change $2.00 to **$1.95**

p. 668
Guide to Marine Fishes
Change $6.50 to **$5.95**

p. 673
TAP
Defunct

p. 674
Real Time 1
Out of Print

p. 675
Birth and Death and Cybernation
Change title to **Cybernetics of the Sacred, $2.50 paperback**

p. 681
Rural Mimeo Newspapers
Change $1.25 to **$2.25**

The Paper Trip
Change $5.95 to **$5.00**

p. 688
Mural Manual
Change $2.00 to **$5.95**

[more→]

Financial advice to CQ

Dear Stewart:

I want to put in writing some of my thoughts about the future of CQ and the remaining Point funds. I write because you seem to listen better this way and because it gives me a chance to think; I think very slowly, contrary to anyone else's observations.

The greatest emphasis I can give to what I have already said is to repeat it: I think that you should put the majority of your energy into drastic cost cutting. My reasoning is simple; and I'm willing to make it a strong statement because it is intuitive and based on the total experience of my past ten years. Why cut costs? Because "cost cutting" (1) deals with the "known," (2) the results of your efforts are measurable, and (3) the consequences are predictable. None of these statements can be made with much confidence about efforts to increase revenue.

Allow me a one paragraph related digression . . . as follows:

In talks I've been giving around the Bay Area these days I have begun to suggest that money is like a "best friend." The analogy is that money will always tell you objectively what you want to know about yourself and what you are doing, that money doesn't care if you get mad at it, and money will only answer questions when you ask. A second thing that I've begun saying, usually in talks with Briarpatch groups, is that "business" is in the world of "magic," which is why it's interesting. Since it is MAGIC, Business School training is nearly useless. (Business School is only good for teaching rational processes for cutting costs, optimizing production, and sorting out people who are interested in business and introducing them to each other.) Business creates some real experts, often these are families like the Rothschilds or wise old men who have been in business a long time; all of these experts have very strong traditions and beliefs about what must be done to run a successful business and of course most of these traditions contradict what others have learned. You know the difficulty of certifying the unknown. When someone tells you how to increase your sales you discount it heavily, when some one tells you why the public bought your product, after-the-fact, you usually discount it completely, and yet those are the two magic questions in business (how to sell, and why did it sell?) Magic, is the name we and Bateson give to what we don't understand and wish to treat with respect. Putting what I say in my recent public talks together with what I talk about in the Briarpatch it comes out: We must learn what we can from the objective statements money will make to us, it will help us in understanding the magic of Revenues.

Looking at the experience of CQ as told to us by revenues and costs over the past year and a half, the message seems to me to be quite clear: Costs are stable and have not decreased, – total costs increase in direct proportion to the number of pages – with the current fees paid for contributed material the volume of material is greater than the space available to print it – subscription volume is virtually static, (growing very slowly from its current low level) – direct sales through Bookstores with copies selling at $2.00 each is the major source of revenue – sales have grown at rates close to 1,000 copies per issue, this rate has been constant except for one issue which did very, very poorly for reasons that have not been established. That issue (Panthers) had a cover with photo, and the layout and content were significantly different; Only the price, name, and the size were comparable to the standard CQ.

This tells me that a big change in the subscription rate-of-growth could only occur over a long period of time, that Bookstore sales are vulnerable to significant decreases in volume for any issue based on its content or cover elements and that with a very substantial history, 1½ years, sales growth can not be expected to increase at any unusual rate.

Conclusion: Survival depends on costs being cut to break-even point, $23,000 per issue, by yearend.

I would also suggest that your personal finances could be deeply enmeshed in the problems of the CQ whether you want it or not. Point owes you $15,000 for this year. You can take it now which would protect you but may jeopardize CQ; take it later when the outcome of current experiments are better known, so you risk loss of the money and CQ's fate could still be uncertain, or hang back to see what's left at the end of the year and let the $15,000 hang with the rest of your fate which is intimately tied to CQ anyway.

In all this discussion I have not mentioned "content" because the Quarterly hasn't been going long enough for its Revenues to indicate the precise connection. My personal view is that you must choose between (A) a journal of contemporary records and (B) a newsletter of the most interesting experiences from the evolutionary front lines. To me they are mutually exclusive because the first is for libraries, vaults and dusty basements.

Sincerely,

Michael Phillips

Well, Michael, we have left out good material to keep this issue to 144pp., with results visible in our accounting. I will postpone my income this year till next year, not needing it now nor worried about getting it then. And we are pressing ahead with salesmanship – with some effect already. I look forward to breaking even so we can lay off that. Saying "We're good. Buy us," leaves a metallic taste in the mouth.

–SB

p. 696
This Business of Music – More About This Business of Music
Change $6.95 to **$10.95**

p. 707
Game Theory
Change $2.95 to **$3.75**

p. 708
Post Scarcity Anarchism
Change $2.95 to **$3.95**

p. 711
How to Father
Add **$1.95 paperback**

p. 712
Paddle-to-the-Sea
Change $4.20 to **$6.95**

Paddle-to-the-Sea, etc. – Minn of the Mississippi
Change $4.07 to **$4.95**

p. 713
Watership Down
Add **$2.25 paperback**

p. 714
The Top
Change $7.50 to **$2.98**

p. 720
The New Schools Exchange Newsletter
Change $10/yr (bi-monthly)
to **$10/yr individuals (10 issues)**
$12/yr institutions (10 issues)
Change New Schools Exchange, etc.
to **New Schools Exchange**
Pettigrew, AR 72752

p. 724
My Computer Likes Me . . . when I speak in BASIC
Change $1.19 to **$1.50**

p. 730
Standard Handbook for Telescope Making
Change $8.95 to **$9.95**

p. 731
Teaching Science as Continuous Inquiry
Change $10.95 to **$11.95**

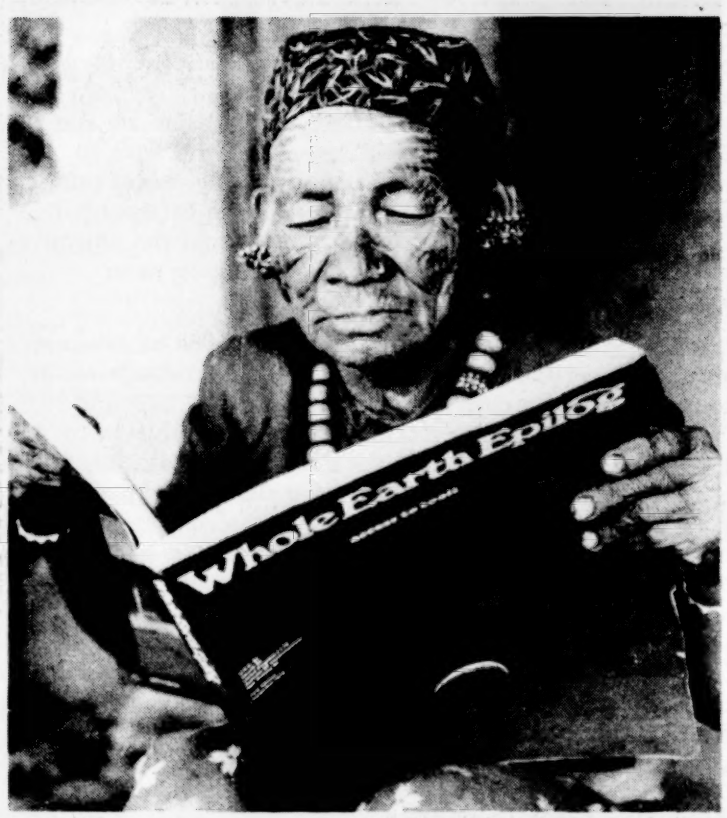
p. 740
The Natural Depth in Man
Change $1.50 to **$1.75**

p. 741
Advanced Techniques of Hypnosis and Therapy
Change $19.75 to **$24.00**

p. 743
The Gospel of Christian Atheism
Out of Print

p. 744
The Jewish Catalog
Change $5.00 to **$5.95**

p. 764
Index - Paddle-to-the-Sea
Change 716 to **712**
Politics of Space 512
Change Politics to **Poetics**



Dharma reader

Dear Whole Earth Publishers:

The enclosed fotos were shot of my "Dharma Mom" while perusing my W.E.E. copy . . . when I told her that the cover was shot of the earth from a long way away, she said predictably: "But where are all the people and trees?"

Brot Coburn, Peace Corps
Kathmandu, Nepal

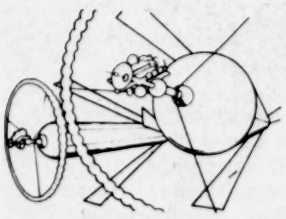
Space Colonies questionnaire

The CQ *is in cahoots with O'Neill and company. We'll be pursuing the subject of Space Colonies in future issues. Best we find out now where you are about it all. Interesting response we'll print and pay for.*

☐ **Space Colonies are a good idea.**
☐ **Bad idea.**
Reasons:

☐ **I want to go.**
☐ **I'm staying here.**
Reasons:

☐ **I want to help.**
Particularly on:



Name _____

_____

_____
Zip

Send response (on this or other paper) to: The CQ, *Box 428, Sausalito, CA 94965. If you're interested in Space Colonies you'll probably want to get O'Neill's newsletter. Details and address on p. 25.*

Gossip

Salesman mode has come to Whole Earth. To keep our peculiar little magazine alive (and incidentally sustain the research continuity toward the eventual "next" CATALOG) we are hustling hard. Andrew Fluegelman and Pam Cokeley have organized promotions-research and bookkeeping to a fine edge. Diana Fairbanks got me onto the Today Show, where Barbara Walters and I traded affable sneers minutes before the Apollo-Soyuz liftoff. Barbara Dezonia — of old CATALOG and Place *magazine — has scheduled us a two-day media flash in Los Angeles.*

There's always a complicated few minutes on talk-shows while I explain that, yes, I sort of do have three items to show here — this brand-new IMPROVED 16th edition of the CATALOG, and this EPILOG which is not our competition, it's us, AND this nice magazine that can not be summed up in a clever sentence — but you see the point is THEY'RE ALL ONE BOOK.

Readers have been a considerable help. One, Henry Allen, placed a full-column review of The CQ, *with color picture, in the Washington* Post's *Potomac Magazine. Another, Ray Lefebvre, of Baton Rouge, Louisiana, sent us a friendly $100, thereby becoming our first Sustaining Subscriber (see inside back cover). Mark Musick (Olympia, Washington) and Heinz Von Foerster (Pescadero, California) sent generous tips with their subscriptions. Several of our contributors (Don Sampson, Russell Schweickart) asked to be paid in subscriptions to their friends instead of money. Distributors like Ivan's News and RPM have made special efforts in our behalf.*

Meanwhile we've curtailed the size of the magazine and raised its cover price from $2 to $2.50. The new CATALOG is $6 instead of $5. Penguin is graciously holding our debt to them until new CATALOG and EPILOG sales make up the difference (that should occur by Christmas). We'll know by Spring '76 if The CQ *is moving firmly toward the 18,500 subscribers that will pay its way. (By the way, IF we don't make it, all subscribers get refunded.)*

Other notes:

- *You might like to know our deadlines. To get in the Winter issue, material must be to us by Oct. 15. Spring, Jan. 15. Summer, April 15. Fall, July 15.*

- *A remarkable tape recording was made of the entire Demise Party, June 1971, where we gave 20,000 dollars to a crowd of 1500 people — as soon as they could decide what to do with it. Stephen Hill borrowed the only copy of the eight-hour tape and then loaned it to one Suzanne Opton, who dropped out of sight with it. She was last heard of in Chelsea, Vermont, supposedly leaving for San Francisco. Anthropologists and economists agree it's a fascinating, poignant, hilarious historic tape. We need it back.*

J. D. Smith, fresh out of wild Idaho hot springs is taking on the editing of the Winter issue of The CQ. *He and Jeanne Campbell have already accumulated goodies on hypnosis, islands, detective work, gambling, and the definitive cheap reference books. I'm laid back a ways, finding stuff for the Spring issue, wandering around listening for adventure's call. Any suggestions?*

–SB

Costs

Production		
Staff Salaries	$9,300	
Contributors	3,000	
Office	1,600	
Production Supplies	1,500	
Phone	900	
Research	400	
Misc.	600	
		$17,300
Printing (20,000 copies)		9,800
Promotion		
Subscription Inserts (20M)	1,000	
Bookstore Announcements (4M)	500	
Review Copies (150)	250	
		1,750
TOTAL COST		$28,850
Unit Cost		$1.4425

Projected Income Per Copy

Bookstore & Newsstand	
Retail Price	$2.50
Wholesale Discount	(1.25)
Shipping (avg.)	(.072)
Net	$1.178
Subscribers	
Subscription Price	$1.50
Process New Sub/ Renewal (avg.)	(.045)
Mailing Label	(.065)
Label, sort & tie	(.048)
Postage (avg.)	(.025)
Net	$1.317

Projected Profit (Loss)

7,500 Bookstore @ 1.178	$ 8,835
4,700 Subscribers @ 1.317	6,190
Total Cost	(28,850)
LOSS	($13,825)

We're presenting our report in a new format, which hopefully reflects more clearly the state of our financial health. Some notes:

- *Our already-cinched belts have been tightened another notch. We've shaved production costs where we could, and kept this issue to 144 pages, notwithstanding Stewart's frustration at having to skim cream off the cream of material we're receiving.*
- *As anticipated in the last issue, we've had to raise the cover price to bring it more in line with the cost of selling through bookstores and newsstands. A year's subscription has become an even better deal (40% saving) while remaining a better deal for us too.*
- *The projected income from subscribers is based on the per-issue cost of a one-year subscription. The cost of processing a new subscription or renewal includes the 12 cents we pay for each returned business reply envelope. The cost of producing mailing labels includes keeping our computer (a.k.a. Mike Young) informed of address changes.*
- *We're still losing 12.5 cents on each copy sent to subscribers and 26.5 cents on each copy sold at retail.*
- *The 7,500 projected bookstore sales reflects the fact that about 25% of the 10,000 copies we ship to stores will eventually be returned. (No one buys the "last" book.)*

As of 8/25/75, we have about 3,500 subscribers; our 4,700 projected figure is an estimate of how many readers will respond to the subscription forms we've prayerfully tucked in the back of this issue.

The CoEVOLUTION Quarterly

Editor Stewart Brand

Managing Editor Andrew Fluegelman

Circulation Director Pam Cokeley

Research Traffic & Accounting Andrea Sharp

Production Manager Diana Fairbanks

Typesetting Evelyn Eldridge, Joy Byars

Camera Andrew Main

Paste-up Carol Kramer, Jeanne Campbell, Diana Fairbanks, Andrew Main

Illustrations Dan O'Neill, Carol Kramer, Jay Kinney

Land Use evaluations Richard Nilsen, Rosemary Menninger, Peter Warshall

Soft Tech, Shelter, & Nomadics evaluations J. Baldwin

Personal Computer section Marc Le Brun

Craft evaluations Diana Sloat

Computer Records Mike Young

Mailing Services Mailing Management, San Francisco, CA

Printing (body) Fricke-Parks Press, Fremont, CA
(cover) Hatcher Trade Press, San Carlos, CA

- *If we manage to "sell out" this printing, (6,500 new subscribers) we'll lose $6,800. Our break-even point would be with about 18,500 subscribers and 7,500 bookstore sales.*
- *Most of these figures are best estimates, and the projections are after all only numbers with their full potential for clarity and craziness. Our pocket calculator is kept on the same shelf as our copy of the* I Ching.

—Andrew Fluegelman

Pam Cokeley, Andrew Fluegelman, and Casio Mini-Printer calculator. Nothing teaches math like financial adversity.

Back issues

Back issues of The CQ are available postpaid from us. (Spring '74 is sold out.) 1 copy: $2. 3 copies: $5. 4 copies: $6. More: $1 each. From Box 428, Sausalito, CA 94965.

No. 1 Spring, 1974

Energy Ecology and Economics *Howard T. Odum*
Energy and the Structure of Adaptation *Roy Rappaport*
CoEvolution and the Biology of Communities *Paul R. Ehrlich*
Southwest American Indian Medicine *Bret Blosser*
Mashta *Joan McIntyre*
Theoretical Ecology: Beginnings of a Predictive Science *Gina Bari Kolata*
Reform Minus Government *Vinoba Bhave*
An Introduction to Wood-Carving Tools *Bruce Erman*
Beginning Buddhism *Rich Fields*
Spiritual Tyranny *Sam Keen*

No. 2 Summer, 1974

Setting Food By *Doris Herrick*
Ehrlich's Guide to the Apocalypse: FOOD *Anne H. Ehrlich and Paul R. Ehrlich*
Sanctity and Adaptation *Roy Rappaport*
Natural History Comes to Whole Earth *Peter Warshall*
Land Banking *Huey Johnson*
Gravity Engines and the Diving Engine *Steve Baer*
Sexual Honesty *Shere Hite*
New Games Tournament *Pat Farrington*
Salons and their keepers *Stephanie Mills*
Notes on Provisioning a Small Boat for Extended Cruising *Kathleen Pumphrey*
Apple Picking *Rick Fields*
Bookmaking Access *Robin Rycraft*
Making and Playing the Shakuhachi *Monty H. Levenson*
Gorf *Michael McClure*
The Point/Penguin Books Publisher-Distributor Contract for the Whole Earth Epilog *Lawrence Klein*

No. 3 Fall, 1974

Edited by the Black Panther Party *Huey P. Newton, Elaine Brown, Ericka Huggins, David Du Bois*

No. 4 Winter, 1974

"The whole system is out of whack" *Dale Jorgenson*
Energetics' Shortcomings *Hazel Henderson*
Enough Energy for Life & The Next Transformation of Man *Lewis Mumford*
The Creature and Its Creations *Gregory Bateson*
This Superfluity of Naughtiness *Warren McCulloch*
"Where!?" *Carl Sagan*
Winemaking at Home *Phil and Mike Palmer*
Establishing the Home Vineyard *Phil and Mike Palmer*
Metric System Con *Steve Baer*
Man-Made Planets, Seriously *Graham Chedd*
Lunaception *Louise Lacey*
Preventive Dentistry Primitive Style: A Case History *Walter W. Fingar and Stephen A. Ross*
Rich is Beautiful! *Michael Slattery*
To South America *Lynn Meisch*
The Great Gaming-House *Kelly Yeaton*
The Entire History of Man *my*
Dharma taking root in the (south) West *Zim*

No. 5 Spring, 1975

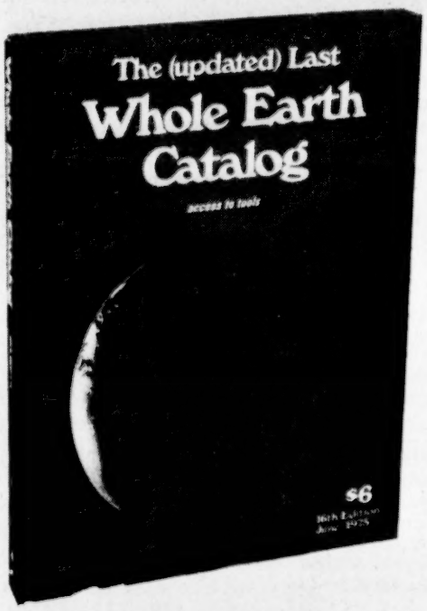
2025, If . . . *R. Buckminster Fuller*
Plains of Science, Summits of Passion *Kenneth E. Boulding*
Energy Choices *edited by Medard Gabel*
The Culture of Agriculture *Wendell Berry*
Small Tractors *Richard Nilsen*
The Preservation of Old Buildings *Wendell Berry*
Energy Stories *Steve Baer*
Nitinol: Torque of the Town *Fred Gardner*
One Highly-Evolved Toolbox *J. Baldwin*
Zen Pants, Fat Pants *Paul Reps and Annie Leibovitz*
Jerusalem: Innerviews *S. N. Durkee*
Jack and the Monster *Gurney Norman*
"Furthur" to the Smithsonian *Stewart Brand*
South of the Slot *Dan O'Neill*
Sesshin Lecture *Zentatsu Baker-Roshi*
The Posthumous Journey of the Soul — Myth & Science *Stanislav Grof, M.D. and Joan Halifax-Grof, Ph. D.*
New Swimming *Rosemary Menninger*

"Or Whole Earth"

means that you can mailorder the item either from the supplier shown, or from:

Whole Earth Truck Store
558 Santa Cruz
Menlo Park, CA 94025

Prices given usually include postage.



New 16th Edition of The (updated) Last WHOLE EARTH CATALOG

Just back from the printers and into the stores, this is OUR update. The entire job of research, correcting, layout and paste-up of corrections, adding new material (cross-references to EPILOG, combination CATALOG & EPILOG index, etc.) was done here by us. It has a thoroughness and polish we never got before. Even a tasty new cover with the colors right.

You can get the new CATALOG at bookstores or from us.

Whole Earth Catalog
1971, 1975; 456pp.
$6.00 postpaid

from:
The CQ
Box 428
Sausalito, CA 94965

No. 6 Summer, 1975

What Do We Use for Lifeboats When the Ship Goes Down? *My*
Living on a Lifeboat *Garrett Hardin*
Holiday for Cynics *Dan O'Neill*
Three From Space *Carl Sagan*
The Atmosphere as Circulatory System of the Biosphere — The Gaia Hypothesis *Lynn Margulis and James Lovelock*
Who's Earth *Russell Schweickart*
Perspectives in Ecological Theory *Ramón Margalef*
Dude Farms *Sally Nicholson*
Seed Clouds, Reap Havoc *Patrick J. Porgens and James R. Bukey*
Sinsemilla Marijuana *Otto Peep*
Making Stone Arrowheads & Scrapers *Gil Verde*
Condoms, These Days *Salli Rasberry and Laird Sutton*
Homing Pigeons *William L. Cassidy*
Jack and His Ego *Gurney Norman*
Relative Poverty and Frugality *Paolo Soleri*
"Reality" and Redundancy *Gregory Bateson*
The Human Use of Inhuman Machines *Dave Caulkins*
The Nature of the Beast *Marc Le Brun*
Advice for the Computer-Lorn or, Getting Yourself a Computer *Dick Rubenstein*
Evaluating Computers for Home or Personal Use *Dick Rubenstein*
Software for Personal Computers *Dick Rubenstein*
The Structure of Mystical Experience *Brother David Steindl-Rast*
Ritual . . . as Communication and as State *Roy A. Rappaport*
Blessing Way Ceremony, Puberty Rite *Maud Oakes*
Le Ronde *Harold Morowitz*

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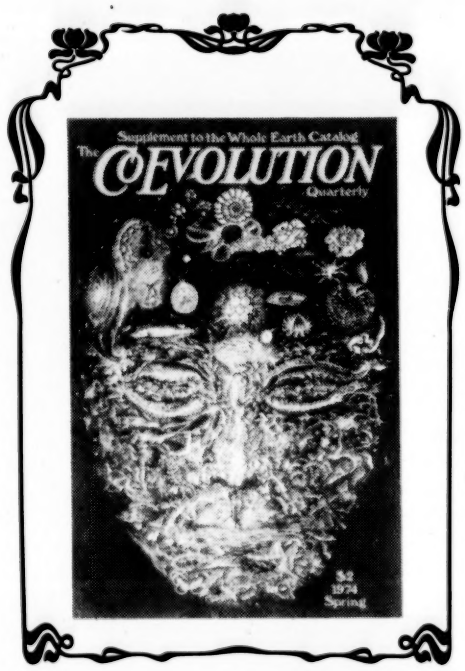


# of Gift, Retaining, Sustaining, and Maniacal Subscriptions

With 20,000 subscribers **The CoEvolution Quarterly** *becomes self-sustaining. At present we have 3,500 subscribers (along with 13,000 newsstand buyers, on whom we lose money). The* **National Geographic** *has six million subscribers.*

Gift

If every present CQ subscriber gave six friends gift subscriptions (total cost $36), we'd be done with running along on the water like a fish-heavy loon and rise gracefully onto our wings. Handy gift forms (any personal message you want to send?) and a postage-paid envelope are bound into this issue.

Retaining

$25/yr. $19 tax deductible. You get your CQ in an envelope, mailed 1st Class, and we gratefully publish your name and town (unless you say not to). By the way, this retaining and sustaining routine I picked up from the creative photography magazine **Aperture**. *The practice helped us launch the original Whole Earth Catalog. Others, such as* **Mother Earth News**, *have used it since.*

Sustaining

$100/yr. $94 tax deductible. You get your CQ in an envelope, airmail, and we gratefully bless your name and town in the magazine (unless you say not to). It's tax deductible because we're a non-profit corporation.

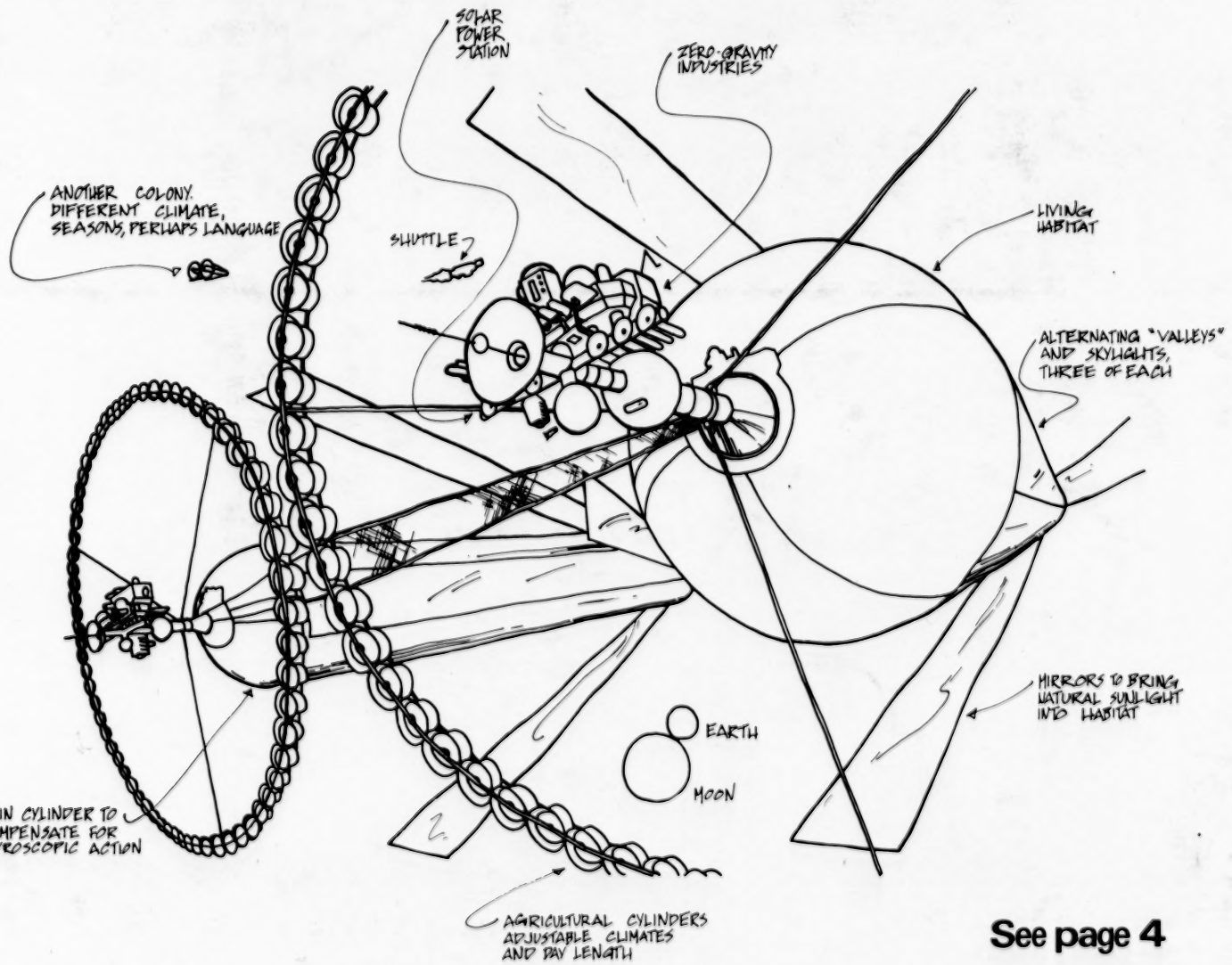
Maniacal

$1000/life. $994 tax deductible. You get your CQ in an envelope, airmail, for the rest of your life (or ours, whichever comes first). In 167 years you'll have yourself a bargain.

—SB

The CQ
Box 428
Sausalito, CA 94965

O'Neill Space Colony, Model III (6.2 miles long – 1.24 miles diameter) at the L-5 Lagrangian Point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ZERO-GRAVITY INDUSTRIES
ANOTHER COLONY. DIFFERENT CLIMATE, SEASONS, PERHAPS LANGUAGE
SHUTTLE
LIVING HABITAT
ALTERNATING "VALLEYS" AND SKYLIGHTS, THREE OF EACH
HIRRORS TO BRING NATURAL SUNLIGHT INTO HABITAT
EARTH
MOON
TWIN CYLINDER TO COMPENSATE FOR GYROSCOPIC ACTION
AGRICULTURAL CYLINDERS ADJUSTABLE CLIMATES AND DAY LENGTH

See page 4